An Investigation into Factors Associated with Compliance with the Heart Manual Cardiac Rehabilitation Programme

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For Alan for "bearing with me."

"This thesis has been composed by myself and the work contained herein is my own"

Signed:

Elinor Cormack

ABSTRACT

Introduction: The present study explores whether there are identifiable differences between people who comply with a home-based cardiac rehabilitation self-help programme (The Heart Manual) and those who are found to be less compliant. **Method:** Forty-six post myocardial infarction individuals were interviewed within one year of having been provided with the Heart Manual programme. Measures used included the Multidimensional Health Locus of Control (MHLC) questionnaire, Health Value questionnaire, the Revised Illness Perception Questionnaire (IPQ-R), the Hospital Anxiety and Depression Scale (HADS) and the Wechsler Test of Adult Reading (WTAR). Demographic information was also gathered. The main aim of the study was to investigate whether specific factors impact on adherence with the Heart Manual. **Hypotheses:** It was hypothesised that adherence would be associated with health locus of control, specifically, internal health locus of control, and or health value and chance health locus of control. Adherence was also expected to have an association with personal beliefs regarding illness related personal control and treatment control, illness coherence and illness consequence. Finally, adherence was hypothesised to be associated with depression, anxiety and intellectual ability. **Results:** Statistical analysis confirmed that there was a significant negative association between chance health locus of control and adherence, and a significant positive relationship between illness coherence and adherence. An association was also indicated between number of years of education and adherence, and level of education and adherence. However, this was complex and was strongest for predicting adherence levels of those who had spent a greater number of years being educated and those who had studied at university level. **Conclusion:** Individuals with high chance locus of control scores were found to be less compliant, while individuals with high illness coherence scores were found to be more compliant. Furthermore, subjects who had spent most years in education, and those who had attended university were also found to have enhanced adherence. **Future Directions:** Further research using a prospective design would be necessary to establish whether the two subscales of chance health locus of control and illness coherence would predict compliance.

Chapter 1. Introduction

1.1 Coronary Heart Disease

Coronary heart disease (CHD) is the main cause of death in the United Kingdom, accounting for more than one in five deaths in males and one in six deaths in females each year. In 2002, CHD caused 117,476 deaths in the United Kingdom (64,473 men and 53,003 women). Approximately 40,000 of these deaths were premature (BHF, 2004). CHD accounts for approximately 22 per cent of premature deaths in men and 13 per cent of premature deaths in women. The highest death rates are found in those of lower socio-economic status. The death rate in middle aged men is up to five times higher than that found in middle aged women, however, in later life CHD is the main cause of death for both sexes. In 2002, there were approximately 268,000 myocardial infarctions (MI) in the United Kingdom. Of those who suffer a MI, 30 to 40 percent of individuals will die as a result of their heart attack. Research has shown that 20 per cent of people who suffer a fatal MI have no warning symptoms prior to their heart attack (Davidson, 2003). Compared to the rest of the UK, the incidence of CHD in Scotland is disproportionately high, with the second highest death rate from cardiovascular disease in Western Europe. In 2002, 11,692 people died from CHD in Scotland (6,190 men and 5,502 women). In the Scottish Highlands (where the present study was carried out) CHD accounts for almost one in four deaths. In 2002, 202 male and 55 female fatalities were caused by CHD in the Highlands. However, around two thirds of individuals survive their initial heart attack and most first-time MI sufferers will return to work and normal functioning within months (Croog & Levine, 1982). In this respect, MI survivors have been shown to benefit from cardiac rehabilitation programmes. It is estimated that there are over 1.2 million people currently living in the UK who have had a heart attack (BHF, 2004). In Scotland as a whole, approximately 8,000 patients every year will survive their initial heart attack (SIGN, 2002). The majority of these people would benefit from a cardiac rehabilitation programme: cardiac rehabilitation has been found to reduce mortality from CHD, while a reduction in subsequent cardiovascular deaths has also been found from these programmes (Oldridge, Guyatt, Fischer, *et al.,* 1988; O'Connor, Buring, Yusuf, *et al.,*

1989). Thus, these programmes are important in reducing mortality and morbidity from this condition.

One of the aims from the Scottish Executive in the public health White paper "Towards a Healthier Scotland" (1995) was to reduce mortality by 60 per cent amongst people under 75 from CHD between 1995 and 2010. This is an ambitious but desirable aim, and improving adherence with cardiac rehabilitation is an essential task if this goal is to be achieved.

Within the national standards for the prevention, diagnosis and treatment of CHD set by the National Service Framework for Coronary Heart Disease (DOH, 2000), the importance of cardiac rehabilitation was acknowledged. It also set an overall goal that 85 per cent of patients discharged from hospital following a heart attack should be offered cardiac rehabilitation. However, figures indicate that there is a long way to go before this goal is met, with data gathered by the British Association of Cardiac rehabilitation in England indicating that in 2000, only one third of patients received cardiac rehabilitation (BHF, 2004). Data for Scotland is not available, but it is recognised that there will be variability in the provision of cardiac rehabilitation across the United Kingdom. It would appear that there is still much to be done to ensure that cardiac rehabilitation is offered to all who could benefit, and to optimise participation for those for whom a cardiac rehabilitation programme is available.

1.1.1 Pathology and Prognosis

The underlying pathology of CHD is disease of the coronary arteries which carry the blood supply to the heart muscle. This results in narrowing of the arteries until finally they are unable to transport sufficient blood for the heart to function efficiently. If this narrowing occurs gradually, angina or signs of a failing heart will develop. If narrowing occurs suddenly or causes a complete blockage (an occlusion) of a major branch of one of the coronary arteries then the individual is likely to suffer a heart attack, otherwise known as an acute myocardial infarction (AMI). The outcome following an AMI varies. Risk of death is greatest during the first hour following the heart attack, but with each

subsequent hour the prognosis improves. Most patients remain in hospital for approximately 7 days, and many will have returned to work within 3 months. Prognosis can be good, and subsequent AMI risk reduced significantly if the individual follows medical advice and modifies their lifestyle to limit their engagement in known risk factors.

1.1.2 Risk factors for Coronary Heart Disease

The exact cause of CHD is not known, but there are a range of risk factors which play a part in inducing CHD. Poor diet is one of the most well known risk factors, specifically a diet high in fat and salt. Approximately 30 per cent of CHD deaths are estimated to be due to poor diet (European Heart Network, 1998), with physical inactivity accounting for between 1-24 per cent of CHD (World Health Organisation Report, 2002). Risk of death from CHD is found to be 75 per cent greater in heavy smokers and 50 per cent higher in other smokers than in non-smokers (Doll, Peto, Wheatley, *et al.,* 1994). Furthermore, there is also an increased risk of developing CHD for passive smokers (He, Vupputuri, Allen, *et al.,* 1999). Obesity, excessive alcohol intake, high stress levels, and high blood pressure also increase the risk of suffering a heart attack (BHF, 2004). While other risk factors are excess low-density lipoprotein (LDL) cholesterol (with 160mg/dL and above considered to be excess levels), low levels of high-density lipoprotein (HDL) cholesterol (with less than 40mg/dL considered indicating a greater risk), and high triglyceride levels (normal levels are less than 150 mg/dL) (Jonkers, Van de Ree, Smelt *et al.*, 2002).

In 1959, Friedman & Rosenman reported the Type A personality as another risk factor associated with the development of CHD. The risk from this behaviour pattern was found to be greater than the risk factors of age, high blood pressure, serum cholesterol and smoking (Review Panel, 1981). However, more recently this has been superseded by the view that the important component related to cardiac risk is the hostility component of Type A behaviour (Kranz, Contrada, Hill *et al.,* 1988; Williams & Barefoot, 1988). Those who have a hostile attitude or propensity to hostile outbursts are found to be at increased risk of suffering a heart attack (Miller, Smith & Turner, 1996). It is also recognised that plasma lipids such as cholesterol and triglycerides are also found to be

higher in hostile individuals (Dujovne & Houston, 1991), and these are also risk factors for CHD development. Understanding of the precise mechanism by which Type A behaviour, or hostility, impacts on CHD development is limited, but the importance of these factors is well recognised. Along with hostility, other Type A characteristics considered important predictors of CHD are time urgency and competitiveness (Chesney, Hecker & Black, 1988). Individuals with characteristics of hostility, time urgency and competitiveness are, however, also more likely to engage in other risk behaviours. These risk behaviours include smoking, excessive alcohol consumption and dietary fat intake, and it is argued that the hostility component risk for CHD may be, at least in part, mediated through these behaviours (Everson, Kauhanen, Kaplan *et al.,* 1997). There is evidence that hostility may be linked to cardiac event onset as some MI survivors report that anger preceded their heart attack (Mittleman, Maclure, Shewood *et al.,* 1995). Thus hostility may have a triggering role in AMI and as such stress management and anxiety reduction may be important components of rehabilitation for these individuals.

The number of deaths from CHD has been declining since the late 1970s due to reductions in risk factors and improvements in treatment. However, in spite of this, the financial cost of CHD to the economy remains high, at an estimated cost to the National Health Service alone of £7,055 million per year (BHF, 2004). It is therefore clearly important that factors which may reduce the incidence of CHD are further investigated.

1.1.3 Prevention of CHD

When considering risk reduction for CHD, there are three levels of prevention: primary, secondary and tertiary. The United States Preventative Services Task Force (1996) defines these levels as follows: primary prevention as "measures provided to prevent the onset of a targeted condition"; secondary prevention as "measures that identify and treat asymptomatic persons who have already developed risk factors or pre-clinical disease, but in whom the condition is not clinically apparent"; and tertiary prevention as "involving the care of established disease, with attempts made to restore function, minimise the negative effects of disease and prevent disease-related complications."

It is recognised that there is much that can be done to reduce the impact of cardiovascular disease. Prevention at the primary level is the most effective as this reduces the distress and cost associated with this disease, for the individual, their family, and employer. The financial burden on the healthcare system is also less if disease incidence is reduced. It is recognised that much can be done to reduce risk at this level by, for example, stopping smoking (Schnall, Landsbergis & Baker, 1994), and engaging in regular exercise (Ewart, 1995). At the secondary level, maintenance of an active, rather than sedentary lifestyle, has been estimated to reduce AMI risk by 35-55 per cent (Bauman, 1998). However, even once onset of the disease has occurred there is much that can be done to limit disease progression at this tertiary level, with, for example, smoking cessation associated with reduced mortality and reduction in subsequent MI's (Vlieststra, Kronmal, Oberman, *et al.,* 1986). Therefore it is recognised that much can be done to reduce the impact of CHD.

Although family history and genetic factors also play a part with regard to CHD risk, prevention and treatment programmes involving healthy lifestyle behaviour patterns and consultation with the medical profession can reduce risk (BHF, 2004).

It is generally agreed that many of the resulting deaths from CHD are premature and could indeed be prevented through reduction in one or more of the known risk factors (Price, 1982). A differentiation has been made between factors which are considered to be non-modifiable (such as age, gender, genetic history, inherited high cholesterol level and socio-economic status) and those that are modifiable (such as smoking and alcohol intake, diet, raised levels of cholesterol and triglycerides, sedentary lifestyle, high blood pressure, obesity, stress and the personality characteristic of hostility). Approximately 90 per cent of patients, already diagnosed with CHD are found to engage in one or more lifestyle risk factors such as smoking, having an unhealthy diet or lack of exercise (Campbell, Thain, Deans, *et al.,* 1998). Subsequently these risk factors are likely to increase the risk of suffering an initial heart attack, and if these behaviours are not modified, MI patients are at risk of further heart attacks. Therefore, although there are some risk factors which cannot be directly influenced such as age or family history of heart problems, there is a lot which can be done to reduce the risk of suffering a heart attack.

Smoking cessation is found to reduce mortality by 50 per cent (Daly, 1983), while risk reduction from CHD also occurs with dietary modifications (Pyorala, De Backer, Graham, *et al.,* 1994). Increases in certain foods, specifically fruit and vegetables, are considered to have a protective effect on the heart and reductions in fatty foods can reduce cholesterol (Leren, 1966; Pyorala, *et al.,* 1994). Weight loss, particularly in overweight patients, is also beneficial both in its own right and also because of the impact it has on improving blood pressure, lipid concentrations and glucose intolerance (Katzel, Bleecker, Colman, *et al.,* 1995).

The health risks associated with Type A behaviour characteristics, such as time urgency and hostility, can also be reduced. A cognitive behavioural approach aimed at modifying time urgency and free-floating hostility has been found to reduce both MI recurrence and mortality rates in patients who had already suffered an acute MI (Friedman, Thoresen, Gill, *et al.,* 1986). In another study, serum cholesterol, triglycerides and blood pressure levels, which are all correlated with CHD, were reduced in post MI individuals following a stress and anxiety management programme (Suinn, 1980). Similarly, stress monitoring and intervention is found to reduce the risk of subsequent cardiac death and infarction in highly stressed post MI patients (Frasure-Smith, 1991). As high stress in these patients is associated with a threefold risk in subsequent death from a cardiac event and a 1.5 increased likelihood of reinfarction (Frasure-Smith, 1991), modification of these behaviours is also important in reducing subsequent health risk.

The lifestyle modifications outlined above are found to interact, both physiologically and psychologically, and as such are likely to enhance secondary prevention. For example, a change to a healthier diet along with regular exercise result in lower cholesterol (Stefanick, Mackey & Sheenan, *et al.,* 1988), and physical exercise is known to reduce anxiety (Kannel, & Sorlie, 1979). The subjective feeling of improved health is likely to enhance adherence to other recommended treatments (Thompson & De Bono, 1999).

The above are all behaviour changes within an individual's control which will reduce their chances of having heart problems and as such are important aspects of cardiac rehabilitation programmes.

1.1.4 Benefits of Cardiac Rehabilitation

There is substantial evidence that lifestyle changes are effective in secondary prevention, irrespective of other modifiable or non-modifiable risk factors. Psychosocial interventions in particular are found to have many benefits. For example, a meta-analysis of psychosocial interventions in patients with coronary artery disease indicated that psychosocial interventions are effective in a variety of ways, including lowering blood pressure, improving stress levels and reducing morbidity and mortality (Linden, Stossel, & Maurice, 1996). Similarly an overview of 22 randomised trials of an exercise-based cardiac rehabilitation program reported a 20 per cent reduction in overall mortality during the first year post-MI. This reduced risk from cardiovascular mortality was found to be evident for up to 3 years after infarction (O'Connor, *et al.,* 1989). Another meta-analysis of comprehensive cardiac rehabilitation programmes indicated a 24 per cent reduction in all-cause death, with a 25 per cent reduction in cardiovascular mortality (Oldridge, *et al.,* 1988). A more recent meta-analysis, involving almost 9,000 patients, reported a 34 per cent reduction in cardiac mortality (Dusseldorp, van Elderen, Maes, *et al.,* 1999). This latter study concluded that there was a 29 per cent reduction in recurrent heart attacks at 2 to 10 year follow-up in cardiac rehabilitation programmes which incorporated psychological and/or educational interventions. The benefit of the exercise component also relates to quality of life, as those who exercise have been shown to benefit over those who do not by 1) reaching their optimal level of functioning more quickly (Hung, Gordon, Houston, *et al.,* 1994; Greenland & Chu, 1988); 2) requiring fewer doctor or hospital visits (Ades, Huang, & Weaver, 1992) and 3) having an improved return to work rate (Boudrez, De Backer, & Comhaire, 1994). Thus, psychosocial interventions such as these contribute substantially to successful cardiac rehabilitation outcome.

1.1.5 Cardiac Rehabilitation Guidelines

Cardiac rehabilitation has been defined by the World Health Organisation as "the sum of activities required to influence favourably the underlying cause of the disease, as well as to ensure these patients the best possible physical, mental and social conditions so that

they may, by their own efforts, preserve or resume when lost, as normal a place as possible in the life of the community" (WHO, 1993).

National Guidelines state that cardiac rehabilitation should be comprehensive, instigated soon after the MI, based on individual need and be an option for everyone who may benefit (Thompson, Bowman, Kitson, *et al.,* 1996). The guidelines state that the main objectives from a psychological perspective are to encourage appropriate adjustment to the diagnosis of heart disease, aid secondary prevention and optimise quality of life. The most important aspects of cardiac rehabilitation programmes identified by the guidelines are medical and psychosocial care, education, exercise, secondary prevention and vocational advice (Thompson, et al. 1996).

The Scottish Intercollegiate Guidelines Network (SIGN, 2002) states that it is useful to consider four phases of cardiac rehabilitation:

Phase 1 – involves medical evaluation; risk assessment; explanation and understanding, whereby patients are educated and kept informed of the nature and implications of their heart problem and discharge plans.

Phase 2 – post-discharge, whereby patients have been introduced to a specific rehabilitation intervention with ongoing support offered either through personal or telephone contact. These cardiac rehabilitation programmes also provide advice regarding secondary prevention, exercise training and psychological support.

Phase 3 – often a structured exercise programme, in a hospital or community setting, incorporating further educational and psychological support. Advice on long term re-education and adaptation regarding their cardiac condition, vocational guidance and risk factor advice.

Phase 4 – long term maintenance regarding risk reduction behaviours, including regular exercise, healthy diet, smoking cessation and stress management.

Cardiac rehabilitation is comprehensive in its outlook and wide-ranging in its aims. However, the lack of provision of high quality rehabilitation programmes continues to cause concern, as although the number of patients being offered such programmes has increased in recent years, there have been questions raised regarding the quality and therefore benefits provided (Campbell, Grimshaw, Ritchie, *et al.,* 1996). Furthermore, there has been specific concern over whether the psychosocial elements of many of these programmes are adequate (Lewin, Ingleton, Newens, *et al.,* 1998).

1.1.6 Psychological Impact of Myocardial Infarction

On an individual level, the experience of having a heart attack is both painful and frightening and the lifestyle changes that may be recommended in order to reduce risk of any further attacks can have psychological implications for the patient. In particular, anxiety and depression are relatively common following a MI as people adjust to having suffered and survived such a major health scare (Frasure-Smith, Lesperance, & Talajic, 1995a). Understandably, emotions are often aroused in the immediate period following a heart attack, and in the initial recovery period (Cay, Vetter, Philip *et al.,* 1972a; Cay, Vetter, Philip *et al.,* 1972b). However, it is argued that symptoms of depression and anxiety are relatively common, and can persist throughout the first year following MI (Lane, Carroll, Ring, *et al.,* 2002).

1.1.6.1 Depression

Depression is found in 13-19 per cent of patients who have suffered a MI (Ladwig, Roll, Breithardt, *et a.,* 1994; Frasure-Smith et al., 1995a; Breithdardt & Borggrefe, 1991), although the experience of depression following a heart attack is not linked to severity of the infarction (Ladwig, Kieser, Konig *et al.,* 1991). Depression is found to result in increased re-admissions to hospital, reduced return to work rate, reduced likelihood of remaining at work and poorer sexual functioning (Stern, Pascale & Ackerman, 1977). Furthermore, those who were depressed post-infarction have increased risk of re-infarction and poorer quality of life. Detection of depression in patients recovering from a heart attack is important as depression is found to be a risk factor for non-adherence to

medical regimens (DiMatteo, Lepper, & Croghan, 2001). Specifically depression is found to be linked with non-adherence with anti-hypertensive medication (Wang, Bohn, & Knight, 2002), with depressed individuals three times more likely to be non-adherent to medical treatment regimens than non-depressed individuals (DiMatteo, et al, 2000). Therefore where depression is indicated it is likely to have a detrimental impact on adherence behaviour and thus can lead to increased mortality (Frasure-Smith *et al.,* 93; Frasure-Smith *et al.,* 1995a; Silverstone, 1990).

1.1.6.2 Anxiety

Anxiety is found in 24 per cent to 31 per cent of MI patients (Denollet & Brutsaert, 1998; Frasure-Smith, *et al.,* 1995b; Frasure-Smith, Lesperance, Juneau *et al.,* 1999). Anxiety level in cardiac patients has been found to be unrelated to the severity of the MI, and in some cases anxiety can be highest in those who are considered to be less ill (Dellipiani, Cay, Philip *et al.,* 1976). Again, with MI patients high levels of anxiety have been linked with poor prognosis (Frasure-Smith *et al.,* 1995b), increased anxiety levels can inhibit a return to previous levels of activity (Dellipiani *et al.,* 1976) and have been associated with impaired quality of life up to 5 years post MI (Wiklund, Herlitz, & Hjalmarson, 1989). However, the relationship between anxiety and patient adherence is less clear than that found between depression and adherence (DiMatteo, *et al.,* 2000). Some studies report that increased anxiety levels are positively associated with adherence to medical regimens, for example with regard to adherence in asthma patients, anxious patients were more adherent (Mawhinney, Spector, Heitjan, Kinsman, Dirks, & Pines, 1993). Other studies have found a negative relationship between anxiety and adherence, one such study found that high anxiety levels were detrimental to adherence to medication and dietary regimens in patients undergoing haemodialysis (Brown Bridge, & Fielding, 1989). A recent meta-analysis investigating patient adherence concluded that the effect of anxiety was variable and generally insignificant (DiMatteo *et al.,* 2000). However, high levels of state anxiety are found to be associated with increased mortality (Thomas, Friedmann, Wimbush *et al,* 1997).

A confounding factor of anxiety symptoms is that they can mimic some symptoms associated with a heart attack. Hyperventilation can cause chest pain and a substantial

number of patients admitted to hospital with suspected heart attacks, are actually suffering a panic attack (Hawton, Salkovskis, Kirk *et al.,* 1999). Therefore, education about identifying and managing symptoms of anxiety is important, particularly for those individuals who have already experienced a MI, and as such is an important aspect of cardiac rehabilitation.

As noted above, there are many lifestyle factors which are implicated in the development of CHD and which can be modified to reduce subsequent risk of cardiovascular incident. However, there are also factors to consider, such as anxiety and depression, which may arise as a direct or indirect result of having suffered an infarction which can impact on subsequent recovery. Identification and alleviation of these are also important in optimising rehabilitation.

1.1.7 The Heart Manual

The Heart Manual (The Heart Manual Project Board, 2002) is a 6-week, home-based, comprehensive cardiac rehabilitation programme for patients recovering from acute myocardial infarction (AMI). It is based on basic cognitive behavioural principles and is collaborative, active and directive. Its aim is to provide patients with a set of skills to enhance their rehabilitation and reduce their risk of further heart attacks.

The Heart Manual programme consists of one book and two tapes. Patients are introduced to the Heart Manual while they are still in hospital by nursing staff. Although the Heart Manual was developed to provide a self-administered standardised cardiac rehabilitation programme, support is also provided at 1-, 3- and 6-week intervals after discharge, either by telephone or home-visits by a trained Heart Manual facilitator (Lewin, Robertson, Cay, *et al.,* 1992).

The Heart Manual book takes the individual through the six-week rehabilitation programme, which incorporates a graded home-based exercise plan and encourages a return to daily activities, both of which can be individualised. The risk factors are discussed with recommendations regarding management and modification of smoking,

alcohol intake, diet, weight, exercise and high blood pressure. There are also sections on identification and management of psychological factors such as stress, anger, hostility, anxiety and low mood, which if not managed, may impair recovery from the MI. The tapes also include advice on relaxation and stress management. There is also a range of educational material including information on how the heart works, factors which are liable to have contributed to the heart problem, the experience of having a heart attack, prescribed medication and how to deal with recurring physical symptoms. There are sections for the patient to complete as they work their way through the programme and this book can be kept for future reference.

The Heart Manual is also designed to offer advice to partners and family as they are recognised as having an influence on rehabilitation after an MI (Taylor, Bandura, Ewart *et al.,* 1985).

In summary, the Heart Manual programme provides psycho-education about risk factors linked to cardiac disease and of the lifestyle changes which can reduce the risk of subsequent heart attacks. It also aims to alleviate psychological distress associated with the heart attack by offering advice about managing anxiety, stress and depression and encourages a graded return to physical activities.

The Heart Manual is a cardiac rehabilitation programme that fulfils the criteria recommended in the National Guidelines (Thompson *et al.,* 1996). It is also the United Kingdom's leading home-based cardiac rehabilitation programme (SIGN, 2002) and is used by over 160 major NHS health boards throughout Britain (The Heart Manual Project Board, 2002).

The Heart Manual was developed in a research setting, and was designed for patients recovering from acute myocardial infarction (The Heart Manual Project Board, 2002), and several studies have demonstrated the effectiveness of this programme. One study investigating use of the Heart Manual involved a randomised control trial comparing MI patients who were given the Heart Manual with a control group of MI patients who were provided with a health education literature pack. Although the information provided to both groups covered the same areas, the Heart Manual group were found at 6-month follow up to have had fewer hospital re-admissions and at 1-year follow up to have better

psychological adjustment, less contact with their GP's and had reduced anxiety and depression scores compared to the control group (Lewin *et al.,* 1992). Subsequent studies have demonstrated the clinical effectiveness of this programme (e.g. Linden, 1995; O'Rourke & Hampson, 1999) and for those following this programme their quality of life is enhanced (Lewin *et al.,* 1992). Use of the Heart Manual has been shown to improve psychosocial functioning and minimises health service use for these individuals during the subsequent year. The self-help nature of the Heart Manual, which is followed at home, requires only minimal support from existing staff. It is therefore a cost efficient way to provide a rehabilitation programme for these patients compared with traditional hospital based rehabilitation (Dalal, 1999).

As discussed above, cardiac rehabilitation programmes have been found to reduce psychological distress following a MI, significantly reduce the risk of subsequent heart problems and promote a return to normal life. Therefore these programmes enhance patients quality of life and reduce morbidity and mortality (Hedback, Perk, & Perski, 1985; Oldridge, 1991; Oldridge *et al.,* 1988; O'Connor *et al.,* 1989). Non-adherence with such rehabilitation programmes carries consequences of increased health care costs for services and impaired quality of life or shortened life span for the individual (SIGN, 2002). Given the strength of evidence supporting the efficacy of rehabilitation programmes in improving outcome for patients who have suffered a myocardial infarction (e.g. Oberman, 1989; Oldridge *et al.,* 1991), and the costs of non-adherence both at an individual and a service level, it is necessary to understand factors mediating adherence to such rehabilitation programmes in order to maximise their effectiveness.

1.1.8 Adherence

Adherence and compliance are terms used to refer to the extent to which patients carry out the treatments or behaviours which are recommended by their clinicians. The term adherence is often preferred, as the expression compliance has connotations of authoritarianism by the health profession and reluctance on the part of the patient (Turk & Meichenbaum, 1991). In the present context however, these terms will be used interchangeably. Assessing accurate adherence rates is important in establishing the impact treatment or rehabilitation programmes have on health, although there are

inherent difficulties in accessing this information. Patient report often results in overestimation in adherence rates due to the influence of social desirability (Gordis, Markowitz & Lilienfeld, 1969). However, adherence to general medical advice has been assessed as approximately 60 per cent, so conversely, two in five, or 40 per cent, of patients are either non-adherent or at least have low adherence to their doctors recommendations (DiMatteo, 1985). Following an acute MI, medical recommendations involve medication regimen and lifestyle changes. Adherence to medication for chronic illness is estimated to be approximately 54 per cent (Cluss & Epstein, 1985; Sackett & Snow, 1979), while adherence with lifestyle behaviour change, such as smoking cessation or dietary changes, are recognised as being more difficult to comply with (Haynes, 1976), thus adherence in these domains is often low.

1.1.8.1 Adherence with Cardiac Rehabilitation Programmes

Despite the established benefits of cardiac rehabilitation programmes as a whole (O'Connor *et al.,* 1989; Linden, Stossel & Maurice, 1996; Oldridge *et al.,* 1988), adherence is found to be relatively poor. In fact it is estimated that although many CHD patients would benefit from such programmes, the majority of patients do not follow these programmes (Pell, Pell, Morrison *et al.,* 1996). One study estimated enrolment on cardiac rehabilitation programmes for post MI patients as between 14 to 23 per cent (Bethell, Turner, Evans *et al.,* 2001). While, Petrie and colleagues found that only a third of patients aged under 65 years old attended an outpatient cardiac rehabilitation programme (Petrie, Weinman, Sharpe & Buckley, 1996), and only 21 per cent adherence was reported by a study with patients' aged over 62 years (Ades, Waldman, McCann *et al.,* 1992). Although adherence rates for the Heart Manual have not been objectively assessed, cardiac rehabilitation staff at two of the main hospitals in the Highlands, which use the Heart Manual, have estimated adherence rates of approximately 50 per cent (M. McGivern, & H. Corrigall, personal communication, October, 5, 2003). Although this is higher than that found in the studies discussed above, there is still considerable room for improvement. The American Heart Association has recommended identification of those who are likely to be non-adherent so that their adherence with the recommended lifestyle changes can be enhanced (American Heart Association Writing Group, 1994).

Adherence is a topic which has generated enormous research interest as it is seen as essential to recovery. Although it is acknowledged that adherence to cardiac rehabilitation programmes may be affected by family, home, work and social circumstances (Mayou, 1984), it is the patient who is considered to hold the ultimate responsibility for adherence.

1.2 Health Psychology: The Role of Beliefs and Attitudes in Adherence Behaviour

The common sense idea that beliefs and attitudes have an influence on behaviour has been examined for some time by psychologists (Ajzen & Fishbein, 1980; Triandis, 1977), and beliefs and attitudes are considered to be important with regard to predicting behaviour. Behaviour prediction is an important area of study in many fields of psychology, and is considered to be of particular importance to the study of health and illness. The study of "health impairing" and "health protective" behaviours (Matarazzo, 1984) are particularly relevant to health psychologists, because the leading causes of death and disability today are chronic disease such as CHD and cancer. These diseases are seen to develop slowly and are heavily influenced by psychological, lifestyle and environmental factors (Taylor, 1991). In fact it has been argued that as many as 50 per cent of premature deaths are considered to be due to potentially preventable lifestyle behaviours (USDHHS, 1990). Furthermore, many of these lifestyle factors can be modified or reduced through psychological intervention. Consequently, health psychologists have attempted to understand and predict health-related behaviour.

Leventhal and colleagues suggested that a combination of factors could be used to predict and promote heath-related behaviour, including patient beliefs regarding their illness and emotional factors such as anxiety and stress (Leventhal *et al.,* 1985). In attempting to predict health behaviour, much emphasis has been placed on health beliefs, perceptions and attributions. This cognitive approach to health psychology has generated several important health behaviour models and theories, which have added to the understanding and prediction of health behaviour. The Theory of Planned Behaviour, the Trantheoretical Model of Change and Health Belief Model are among the most influential of these, and these are discussed below.

1.2.1 The Theory of Planned Behaviour

The role of intention with regards to predicting behaviour was incorporated in the theory of reasoned action (Ajzen & Fisbein, 1980). It is argued that when voluntary behaviour is being considered, individuals will make prior decisions regarding whether they intend to carry out these behaviours or not. Thus, assessment of intention is a useful way to predict behaviour. Intentions are measured by investigating attitudes towards behaviour (what the outcome of the behaviour would be, whether it would be rewarding) and attitudes about a subjective norm. The attitudes about a subjective norm involve how such behaviour would be viewed by others (whether it is acceptable or appropriate). The theory of reasoned action proposes that these two attitudes combine to produce intention, which impacts upon whether or not the behaviour will be carried out. A progression from the theory of reasoned action was the theory of planned behaviour (Ajzen, 1985, 1988; Ajzen & Madden, 1986). The theory of planned behaviour proposes that intentions should be viewed as "plans of action in pursuit of behavioural goals" (Ajzen & Madden, 1986). The important aspects in this model for predicting behaviour incorporate those of the theory of reasoned action with the addition of perceived behavioural control. Perceived behavioural control is the individual's belief that they can carry out the behaviour, with a consideration for factors internal to the individual, such as skill and ability and factors external to the person, relating both to past experience and past behaviour. Attitudes and intentions have indeed been found to influence various behaviours, including smoking (Fishbein, 1982) and losing weight (Schifter & Ajzen, 1985).

1.2.2 Transtheoretical Model of Behaviour Change

Readiness to change is the main focus of the transtheoretical model of behaviour change, or stages of change model (Prochaska & DiClemente, 1982). This model proposes five stages which describe a person's motivational readiness or progress towards modifying problem behaviour. These stages are considered to be important when predicting and understanding behaviour change. These stages are discussed below:

Precontemplation – there is no perception by the individual that they have a problem (for

example a sedentary lifestyle) with no intention of behaviour change.

Contemplation – a realisation that a problem behaviour (such as a lack of regular exercise) should be changed. This stage can last for some time.

Preparation – a strong intention to change a behaviour, with consideration as to how to go about effecting change. Preparatory behaviour may be part of this (such as enquiring about gym membership).

Action – actual engagement in the planned behaviour change, for example, exercising regularly. At this stage relapse is common, so it is recommended that new behaviours should have been followed regularly for a 6-month period before giving official recognition of having reached this stage.

Maintenance – skills developed throughout the previous four stages are used to ensure engagement of the healthy behaviour continues, and relapse prevented.

An important aspect of this model is the view that progression through these stages is not sequential, but that there may be movement between stages until the given behaviour pattern is stabilised. "Decisional balance" is a concept that relates to the consideration of any costs or benefits to the individual of adopting a new behaviour. Decisional balance is recognised to impact on the path an individual may take through these stages (Prochaska, DiClemente, & Norcross, 1992).

1.2.3 Health Belief Models

One of the most influential health belief models is that developed by Rosenstock (1974; Becker & Rosenstock, 1987) which proposes that four main factors are considered when decisions are made regarding health-related behaviour. These factors are: 1) perceptions regarding personal threat or susceptibility to the development of an illness; 2) perception about a given illness severity and consequence; 3) beliefs concerning the risk reduction or health protection, engagement in certain health promoting behaviours may offer; and 4) a decisional balance regarding perceived costs and benefits of engaging in the

behaviour. These models are used to predict health behaviour. For example, with regard to CHD risk, this model would predict that those most likely to engage in heart health promoting behaviour (such as healthy eating, regular exercise) would be those who believed their risk of developing heart disease was high, and that it was a serious illness with serious consequences. They would also have to have faith in the risk reduction these behaviours would offer, and believe the risk reduction benefits of engaging in these behaviours would outweigh the costs. These health belief models have contributed to the understanding and prediction of health behaviours and have been useful in predicting adherence to diabetic regimes (Bond, Aiken & Somerville, 1992).

Models such as those outlined above have been hugely influential in their contribution to health behaviour prediction. However, there have been criticisms against all these models. It appears that health behaviour prediction is a complex process, with each model contributing to our understanding of human behaviour, but as yet no model has been devised which is able to incorporate all of factors which can influence human health behaviour.

Understanding and predicting health behaviour is a complex process, with various factors likely to impact on adherence with health advice. Wallston (1992) argued that health specific locus of control orientation (derived from attribution theory) is an important factor relevant to the understanding of health behaviours.

1.2.4 Attribution Theory

Attribution refers to the process by which we make inferences about the causes of events in our lives and about the behaviour of ourselves and of other people. Attribution theory has been applied to the study of health and health-related behaviours. It is argued that attributions arise because individuals are motivated to see the world as predictable and controllable, particularly if events have personal relevance (Heider, 1944, 1958). Distinctions are made between external attributions, those that are ascribed to factors outside of the individual (such as situational or environmental causes) and internal attributions, those ascribed to the individual concerned (such as personal characteristics, motives or intentions). These ideas have been developed further and incorporated into

theories which hypothesise that internal and external locus of control are personality traits (Rotter, 1954, 1966).

1.2.5 Locus of Control

The concept of locus of control originated from attribution theory (Rotter, 1954, 1966) and relates to the idea that individuals are observed to differ as to where they believe control for what happens in their life is located. The distinction is made between control being perceived as originating from within or outwith the individual. Individuals who believe that control of their lives largely comes from within themselves or feel in a position to influence it, are said to have an *internal locus of control* orientation. Individuals with an *external locus of control* orientation believe that what happens to them is outwith their control and as such they believe they have little or no influence over this. These individuals attribute what happens to them as due to luck, chance, or under the control of others. These beliefs relating to locus of control are considered to have an impact on the behaviour an individual manifests in response to events in their lives. Individuals with an internal locus of control would therefore be more likely to make more effort to influence what happens in their lives, whereas those with an external locus of control are expected to take a more passive stance towards events. The internal versus external dimension of attribution theory has been specifically applied to health in terms of the concept of health locus of control.

1.2.5.1 Health Locus of Control

The concept of locus of control has been applied widely in health psychology and here it relates to an individual's beliefs about where control over their health lies. Health locus of control is considered to be one of several factors implicated in the understanding of health related behaviour. Health related behaviour (that is, behaviours which either enhance or may be detrimental to health status) become particularly important if an individual is suffering from an illness or disease. In these circumstances, health optimising behaviours include adherence to medical advice, adherence with medication regimens or with healthy lifestyle behaviour changes (such as increased exercise,

reducing alcohol intake and so on). Health locus of control, whether *internal or external*, is considered to be an important determinant of engagement either with health promoting behaviours or behaviours detrimental to health. The locus of control model argues that individuals who have a high internal locus of control orientation are more likely to take personal responsibility for their own health, are more liable to engage in behaviours which will improve their health status and thus exercise better control over their disease (Pike, Dupen, Higginbotham *et al.,* 1991). These findings are thought to occur because individuals with an internal locus of control believe that they have some influence over their situation. Conversely, individuals who have a high external locus of control orientation, where they believe that their health status is influenced by fate, luck or chance, are considered less likely to engage in behaviours which could enhance their health status. Furthermore, these external individuals are also less likely to attempt to overcome health-impairing behaviours, even when ill health has been diagnosed as they believe they have little control over their heath status (Pryer & Distefano, 1977).

The concept of health locus of control incorporates the internal – external locus of control distinction. In addition, external control was initially divided into external chance locus of control and other (powerful) people locus of control. The other (powerful) people considered here are family, friends or health-care providers. Wallston, Wallston and DeVellis (1978) developed the original Multidimensional Health Locus of Control Scale (MHLC), which evaluates individuals' health locus of control orientation. Recent research however found that when considering health locus of control for specific health conditions (as opposed to general health locus of control) individuals differentiate between the potential influence that medical professionals may have with regards to their condition, and that of other people (Walton, Stein, & Smith, 1994). Therefore, the dimension of other (powerful) people has been separated into *doctors* and *other people* and has been incorporated into a distinct scale (Form C) within the MHLC Scale (Wallston, Stein & Smith, 1994).

The MHLC: Form C comprises four subscales: *internal*, *external*, *doctors* and *other people*. The alpha reliability of these four subscales are adequate for research purposes, and data from subjects with arthritis and chronic pain demonstrates that these subscales are moderately stable over time, with considerable concurrent and construct validity (Wallston, Stein & Smith, 1994). Form C of the MHLC scales has also been used in the

asthma population and found to have moderate reliability and validity (Dupen, Higginbotham, Francis *et al.,* 1996).

Health locus of control has been found to have an association with certain health behaviours. High internal locus of control individuals are more likely to be influenced by government led campaigns on the dangers of smoking and are more likely to stop smoking than those with external locus of control (James, Woodruff & Werner, 1965; Segall & Wynd, 1990) and are more inclined to partake in physical activity (Carlson & Petti, 1989).

Victims of MI who attribute its occurrence to external factors such as chance have been found to be less adherent with recommended behaviour programmes advised by doctors (Bar-on, 1983). Subsequently, they had significantly lower rates of return to work and to physical and sexual functioning than those who attributed the heart attack to internal or controllable causes (Bar-on, 1987). Conversely, MI patients who considered their condition to have been caused by factors which could be controlled were found to adhere to recommended medical advice, at least during the first year of recovery (Plotkin-Israel, 1984).

1.2.6 Health Value

According to many health behaviour theories, the value placed upon health is also important to the study of health behaviour.

Social learning theory also places emphasis on the value attributed to health (Rotter, 1954). This theory suggests that the potential occurrence of any behaviour depends upon two main constructs: expectancy beliefs and value of the outcome. It is proposed that if an individual believes that a given behaviour will result in achievement of a valued goal (expectancy belief), they will be more liable to engage in the given behaviour. While if health is valued highly by an individual, they are more likely to engage in health promoting behaviours than an individual who does not place such a high value on health. In line with this proposition, Wallston (1991) has argued that MHLC beliefs should be assessed concurrently with health value. The Health Locus of Control scale was

developed to be used in conjunction with assessment of an individual's health value. The Health Locus of Control scales are believed to have greater predictability of health behaviour when health value is also assessed.

Health value is not always included in studies of health behaviour because of the prevalent belief that health is universally valued. Health is indeed often highly rated when individuals are asked to rank lifestyle values (Ware & Young, 1979), but it is not always prioritised as the most important value. Indeed, the goals held in today's society are varied, and although health may be a desirable goal for many, there is also a striving for other goals including occupational and financial success and social acceptance. Behaviour which may enhance one goal, may be detrimental to other goals, therefore the behaviour which is most likely is that which is expected to result in achievement of the most desired goal. The concept of goal value is further complicated by expectation of attainment of the outcome. While certain behaviours have immediate benefits or goals, other goals are more distant and so whether the gain from the behaviour is proximate or more distant will also influence the likelihood of that behaviour being displayed. The importance of health to an individual is also seen to be influenced by their own health status. Those for whom their health has been threatened are more likely to rate health highly. Subsequently it would be expected that if health was considered a priority, behaviours conducive to optimising health would occur more often in those who rate it as important.

Participation in health optimising behaviours has been found to be associated with health value (Mechanic & Cleary, 1980). Furthermore, studies have found that internal health locus of control individuals, who place a high value on health, are more likely to stop smoking (Kaplan & Cowles, 1978), and more liable than others to perform health optimising behaviours (Wallston, Maides & Wallston, 1976; Abella, & Heslin, 1984). Health value is therefore considered to be another important determinant related to adherence. Specifically, the Value Survey is recommended for use in conjunction with the Multidimensional Health Locus of Control questionnaire (Wallston *et al.,* 1976; Smith & Wallston, 1992). The use of the Value Survey in conjunction with the MHLC questionnaire is recommended as it is argued that the interaction of internal health locus of control and health valuation is more predictive of health behaviour than either variable alone (Wallston, 1992).

1.2.7 Illness Perception

"Illness perception" is the term given for the concept that people have their own individual cognitive model with which they make sense of and respond to their particular illness (Leventhal, Meyer & Nerenz, 1980). Beliefs or internal representations are held which reflect an individual's understanding of their previous experiences and are used to both interpret new experiences and plan coping behaviour (Leventhal, Nerenz & Steel, 1984; Leventhal & Diefenbach, 1991). Leventhal and colleagues developed the self-regulation model, which proposes that a patient's illness cognitions are consistent and are used to make sense of their illness, understand any developing symptoms and to provide a basis for their own coping response to their ill health (Leventhal *et al.,* 1984; Leventhal *et al.,* 1991). Illness cognitions are defined as 'a patient's own implicit common sense beliefs about their illness' (Leventhal *et al.,* 1980; Leventhal & Nerenz, 1985). Leventhal's self-regulatory model is based upon problem solving models and proposes that health problems are managed in a similar way to other problems. This model states that when a problem arises attempts are made to resolve the problem. Applying this model to health and illness, the onset of ill health is considered a problem and attempts to resolve this will be influenced by the way in which the illness problem is perceived.

Illness representations or perceptions are considered to be based around distinct components and an individual's illness perceptions can be understood by assessment of these components. Leventhal's self-regulation model (Leventhal *et al.,* 1984) identified these illness perception components as 1) *illness identity* (ideas about the label, the nature of their condition (i.e. associated symptoms) and the links between these), 2) *cause* (ideas about possible cause or causes of the illness), 3) *timeline* (perception of the likely duration of the health problems, i.e. acute or chronic), and 4) *consequences* (beliefs about the illness severity, outcome and impact on physical, social and psychological functioning). Lau, Bernard and Hartman (1989) have also contributed to this area and have indicated that the components of 5) *cure* and 6) *controllability* (belief in the cure or control of the condition) are also important in understanding illness perception. These components are considered to be separate, although not necessarily independent of each other. Illness representations are seen to emerge when ill health occurs and may be modified over time by the progression of the illness, associated symptoms and treatment outcome. The Illness Perception Questionnaire (IPQ - Weinman, Petrie, Moss-Morris *et*

al., 1996), was developed to assess an individual's representation or perception of their illness. The IPQ was based on the components of illness described in Leventhal's self-regulation model (Leventhal *et al.,* 1984) and on the work of Lau and colleagues (1989). Difficulties with the original IPQ lead to a revision of this questionnaire: The Revised Illness Perception Questionnaire (IPQ-R), (Moss-Morris, Weinman, Petrie *et al.,* 2002). The IPQ-R separates the cure/control variable into two subscales of *personal control* (incorporating personal control and self-efficacy beliefs) and *treatment control* (measuring beliefs about treatment outcome). It also incorporates three additional subscales: *timeline-cyclical* (assessing whether the illness symptomatology is believed to be cyclical); *illness coherence* (investigates the extent to which a patient's illness representations provide a coherent understanding of the illness); and *emotional representation* (assessing emotional response to the illness).

Research has confirmed the consistency and validity of the IPQ's four components of identity, cause, time-line (acute/chronic) and consequences (Skelton & Croyle, 1991). Similarly, all subscales of the IPQ-R have good internal reliability (Moss-Morris *et al.,* 2002).

These illness perception questionnaires have contributed to the study of illness behaviour. A strong belief that illness could be cured or controlled in patients admitted to hospital after a first MI was significantly related to subsequent attendance at an outpatient cardiac rehabilitation course (Petrie, *et al.,* 1996). The importance of this cure/control variable was confirmed in another study which also found that attendance at an outpatient cardiac rehabilitation programme was higher in those with a stronger belief in the controllability of their heart condition as assessed by the IPQ (Cooper, Lloyd, Weinman *et al.,* 1999). As discussed above, the cure/control variable was separated in the IPQ-R into two separate subscales, personal control and treatment control. Both of these factors would appear to be important with respect to adherence with rehabilitation programmes.

1.3 The Present Study

1.3.1 Research Aims

The present study aims to investigate possible differences between those who do and do not make good use of the Heart Manual. Identification of such factors would allow for greater predictability of those who are unlikely to benefit from this method of rehabilitation. Should differences be identified work could then be carried out on improving adherence for those who are predicted to have poor adherence rates with the behaviour changes recommended following a MI.

The following will be examined in relation to adherence: internal and chance health locus of control; health value; beliefs regarding personal control, treatment control, illness coherence and illness consequence; depression; anxiety and intellectual levels.

1.3.1.2 Internal and Chance Health Locus of Control

It is hypothesised that individuals with an internal locus of control will be more liable to comply with the Heart Manual Programme, as they believe they can influence their health status, while individuals with high chance locus of control scores would be less likely to comply with this programme as they do not believe that their own actions impact greatly on their health status. Health Locus of Control will be assessed by the MHLC: Form C.

1.3.1.3 Health Value

It is hypothesised that individuals with high health value, as assessed by the Value Survey (in conjunction with high health locus of control) would be more likely to comply with the Heart Manual.

1.3.1.4 Beliefs about Personal and Treatment control

Personal control and treatment control (discussed in section 1.2.7 – Illness Perception) would appear to be important with respect to adherence with rehabilitation programmes. In the present study it is predicted that higher ratings of both personal control and treatment control, as assessed by the IPQ-R will predict greater adherence with the Heart Manual programme.

1.3.1.5 Illness Coherence and Illness Consequence

Two other variables from the IPQ-R of illness coherence and illness consequence (discussed in 1.2.7) were investigated. It is hypothesised that those who believe they have a good understanding of their illness would be more likely to comply with the Heart Manual. This hypothesis is particularly relevant to cardiac health, as it is one illness in which aetiology is well understood, as are the behaviours recommended to reduce risk. It is proposed that adherence with a programme such as the Heart Manual will be enhanced in those who have higher illness coherence scores. Adherence behaviour would be expected to be greater in these individuals as they are likely to believe they have a greater understanding of the factors which may have contributed to their illness, are aware of what they can do to reduce future risk, why they are doing it and of the expected benefits from doing so.

It is also hypothesised that adherence will be lower in those who feel that their heart condition does not impact significantly on their life, that is individuals with low illness consequence scores. Adherence to cardiac rehabilitation programmes like the Heart Manual require both commitment and determination to modify behaviours which may be long term lifestyle habits, and with respect to smoking and alcohol, physically addictive. These changes will therefore require personal effort and it is suggested that adherence to such programmes will occur less often in those individuals who believe there is relatively little consequence from their illness. Thus, if they feel their illness does not impact greatly on their life, they will be less motivated to follow the Heart Manual programme which is designed to influence health and quality of life. The benefit of following this programme may not be perceived to outweigh the costs of lifestyle modification, as they

do not feel their illness compromises these factors to any great extent. Therefore it is postulated that lower illness consequence scores will be associated with lower adherence to the Heart Manual.

In summary it is hypothesised that higher scores on the personal control, treatment control and illness coherence subscales of the IPQ-R will be associated with greater adherence, while lower scores on the illness consequence subscale of the IPQ-R will be associated with lower adherence to the Heart Manual.

1.3.1.6 Depression

Depression has been indicated as being a significant factor linked with non-adherence to treatment (see section 1.1.6.1). In the present study, it is hypothesised that higher levels of depression will be associated with lower adherence.

1.3.1.7 Anxiety

The effect of anxiety on adherence with medical regimens is unclear, increased anxiety levels have been associated with increased adherence in certain studies (Mawhinney, *et al.,* 1993), while others have reported that high anxiety levels are detrimental to adherence (Brown Bridge *et al.,* 1989) (see section 1.1.6.2). In this study it was anticipated that high anxiety would impact on adherence, however the direction of the hypothesis was not predicted.

The Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1994) was utilised to assess participant anxiety and depression levels. The HADS was chosen as it is a reliable and valid measure of anxiety and depression with other medical subjects, and has been used in other studies with cardiology patients (Duits, Boeke, Duivenvoorden *et al.,* 1996). The HADS was therefore appropriate for this study as it does not include somatic items which are present in other measures. Furthermore the HADS is quick to complete and easy to understand and thus reduces demand on patients which was of

particular importance in this study.

1.3.1.8 Intellectual Ability

The nature of the Heart Manual, being an educational programme in text format, may render it open to the criticism that adherence with the programme might vary according to intellectual ability or educational attainment. In order to determine whether such an association is present, measures were used to predict the intellectual ability of participants in the study. It is hypothesised that individuals with higher intellectual ability will be more likely to adhere to the Heart Manual. Intellectual ability was estimated by use of the Wechsler Test of Adult Reading (WTAR; Wechsler, 2003).

1.3.2 Summary of Hypotheses

It is hypothesised that:

1. Health locus of control orientation will impact on adherence:-

Hypothesis 1a) – That those with high internal locus of control scores and / or high health value scores will be more adherent with the Heart Manual.

Hypothesis 1b) – Those with a high chance locus of control will be less likely to adhere to the Heart Manual.

2. Illness perception scores will impact on adherence with the Heart Manual:-

Hypothesis 2a) – That adherence will be greater in those with higher personal control scores.

Hypothesis 2b)- That higher treatment control scores would be associated with greater adherence to the programme.

Hypothesis 2c) – That higher illness coherence scores will be associated with enhanced adherence with the Heart Manual.

Hypothesis 2d) – That those with low illness consequence scores will be less adherent.

3. That mood and emotional state will impact on adherence:-

Hypothesis 3a) – That those who have high levels of depression will be less likely to comply with the Heart Manual.

Hypothesis 3b) – It was hypothesised that high anxiety levels would impact on adherence by either increasing or decreasing adherence. The actual direction of the hypothesis was not predicted.

4. That adherence will be positively correlated with intellectual ability.

Hypothesis 4) – That individuals with higher scores on measures of intellectual ability would have greater adherence to the Heart Manual.

Chapter 2. Method

2.1 Design

This study utilised an opportunistic sample design of participants who had suffered a myocardial infarction within the previous 12 months. The sample had all received the Heart Manual and support from nursing staff. Each participant was assessed on four self-report questionnaires. These were the Multidimensional Health Locus of Control Questionnaire (MHLC), a Value Survey Questionnaire which measured health value, the Revised Illness Perception Questionnaire (IPQ-R), and the Hospital Anxiety and Depression Scale (HADS). The intellectual level of each individual was also estimated using the Wechsler Test of Adult Reading (WTAR), and demographic information, heart health knowledge and adherence levels were also gathered. The independent variables were health locus of control, health value, illness perceptions, anxiety and depression levels and intellectual ability. The dependent variable was adherence with the Heart Manual cardiac rehabilitation programme. Adherence was assessed by asking participants to rate on a visual analogue scale the extent to which they had made improvements in seven health behaviours, as recommended by the Heart Manual, since they had been provided with this rehabilitation programme. The purpose of the design was to allow examination of the strength of associations between the independent variables and degree of adherence.

2.1.1 Ethical approval

Ethical considerations regarding this study included ensuring that the purpose of the study, and the participation nature and duration, were explained to potential subjects in easily understood lay language. Participants were also reassured regarding issues of confidentiality, with only the main researcher aware of the individual questionnaire responses, to all other parties the information provided would be anonymous. There was however a provision that in the unlikely event that any of the information provided was considered crucial to their ongoing health, but unknown to their general practitioner, this would be discussed with the individual and would only be passed onto their GP with the

participants' consent. Subjects were also made aware of their right to withdraw their participation at any time, without this affecting in any way their treatment as a current or subsequent patient. There were no obvious potential risks identified with the study however, a contact number for the cardiac nurse who had initially approached them regarding their participation in the study was also provided to allow them to discuss this study further should they wish to do so. The above information was discussed prior to participants agreeing to take part in the study and was also summarised in an information sheet (Appendix 1) which was sent out to subjects who agreed to participate following initial discussions with their cardiac nurse.

The research project was approved by the Local Research Ethics Committee and the medical director of Highland Primary Care Trust.

2.2 Participants

2.2.1 Inclusion and exclusion criteria

The participants were recruited from Highland Primary Care Trust, and had to satisfy the following inclusion and exclusion criteria. Participants had to be over 18 years and able to give written consent of their agreement to participate in this study. Eligible participants were individuals who had, within the previous 12 months, been diagnosed as suffering a myocardial infarction and had been provided with a copy of the Heart Manual upon discharge. Participants were excluded from this study if they exhibited evidence of cognitive impairment, inability to read or write or if they were suffering from other serious health conditions of recent onset. The source and method of recruitment for participants of the study are described below.

2.2.2 Participant source and recruitment

A primary care sample of participants were recruited through the cardiac rehabilitation staff at both Raigmore Hospital (Inverness, NHS Highland) and Caithness General

Hospital (Wick, NHS Highland). Following a briefing by the researcher to cardiac staff at the above hospitals, the study was discussed with post-MI patients who met inclusion criteria and these individuals were invited to participate. Patients who agreed to participate in the study were provided with the information sheet discussed above (Appendix 1) and contacted by the main researcher who discussed the study further with participants. After a 7-day period, which allowed subjects to further consider whether they wished to participate, an interview location and date was then arranged with subjects. A consent form (Appendix 2) was completed prior to subjects being provided with the questionnaires. Forty-eight patients were referred to the study and forty-seven met the criteria. These forty-seven subjects were invited to take part. One declined on the basis of not being able to commit 1 hour of his time to the study.

2.3 Measures

2.3.1 Multidimensional Health Locus of Control Scale: Form C (MHLC: Form C; Wallston, Stein, & Smith, 1994)

The MHLC Scale: Form C, (Appendix 3) is a general purpose, condition-specific, health locus of control scale adaptable for use with any medical or health-related condition. This questionnaire is adapted by substituting the health condition being studied, in this case "heart condition", for the word "condition" in each of the 18 statements. The MHLC: Form C, is a self-report instrument where subjects are asked to respond to each of the 18 statements with ratings ranging from "strongly disagree" to "strongly agree". These 18 items form the four uncorrelated (or slightly correlated), non-mutually exclusive subscales corresponding to four different loci of control. The subscales are described in more detail below:-

Internal locus of control scale - assessed by statements such as "The main thing which affects my heart condition is what I myself do." Individuals who rate highly on internal locus of control believe that their health status is controlled by what they themselves do and that they can have an influence over their health status.

***External locus of control scales*:-**

1) *Chance locus of control* – assessed by statements such as "Most things that affect my heart condition happen to me by chance." Individuals who rate highly on this believe that their health status is largely down to chance, luck or fate.

2) *Doctors health locus of control* – assessed by statements such as "If I see my doctor regularly, I am less likely to have problems with my heart condition." Individuals who rate highly on this believe that their health status is controlled by medical professionals.

3) Other (powerful) people health locus of control - assessed by statements such as "Other people play a big role in whether my heart condition improves, stays the same or gets worse." Individuals who rate highly on this believe that their health status is controlled by the actions of other powerful people such as family and friends.

The item scores for each of these subscales are summed to produce a total subscale score. With the internal and chance locus of control subscales, scores range from 6 to 36, with ratings of 26 to 30 regarded as high locus of control, and 30 and above very high on these subscales (Wallston, 1989).

2.3.2 Value Survey (Wallston, Maides & Wallston, 1976)

The Value Survey (Appendix 4) is a 10 item self-report questionnaire devised to assess individual values. The survey used was modelled on Rokeach's (1973) Value Survey, with the value 'health', added, to allow determination of the importance of health to an individual when compared with 9 other values including, social recognition and wealth. Individuals were asked to rank these 10 terminal values in order of importance to them, from 1 (most important value) to 10 (least important value). These values are then subtracted from 11, so that the value most important to them is given the highest score (10) and the other values are given equivalent scores in order of their importance to the individual. Thus individuals who rank health as the most important value to them will rank it as a 1, and subsequently be given a score of 10 in this questionnaire for health value.

2.3.3 The Revised Illness Perception Questionnaire (IPQ-R; Moss-Morris, Weinman, Petrie, Horne, Cameron & Buick, 2002)

The IPQ-R (Appendix 5) is a 3 page self-report questionnaire which assesses various illness perceptions. These are described in more detail below.

Illness identity related symptoms (14 items) whereby subjects are asked to rate whether they have experienced various symptoms since their heart attack. If they have, they are then asked to rate whether they believe these symptoms are related to their heart condition. The identity scale is scored by summing the number of endorsed symptoms considered to be related to the illness. Scores range from 0 to 14.

Other illness perceptions investigated include:-

Timeline - Acute/Chronic – 6 items (e.g. "I expect to have this illness for the rest of my life"). With higher scores signifying a belief that the illness will last a long time.

Consequences – 6 items (e.g. "My illness has major consequences on my life"). With higher scores indicating the perception of serious consequences.

Personal Control – 6 items (e.g. "There is a lot which I can do to control my illness"). With higher scores indicating a greater belief in the individual control they can exert over their condition.

Treatment Control – 5 items (e.g. "My treatment will be effective in curing my illness"). With higher scores in those who have a strong belief that their condition is amenable to treatment.

Illness Coherence – 5 items (e.g. "I have a clear picture or understanding of my condition"). With high scores suggesting that they have a good understanding of their condition.

Timeline – Cyclical – 4 items (e.g. "My symptoms come and go in cycles"). With greater scores indicating indicate that their illness symptoms have a cyclical pattern.

Emotional Representation – 6 items (e.g. "My illness makes me feel afraid"). With higher scores indicating that the illness has a greater emotional impact.

Scores for Timeline (Acute/Chronic and Cyclical), Consequences, Personal Control, Treatment Control, Illness Coherence, and Emotional Representation are rated by patients on a five point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" (scored 1 to 5). After reverse scoring appropriate items, scores for each subscale are obtained by summating responses and dividing by the number of items.

Illness Causes – 18 items, whereby individuals are asked to comment on whether they believe various causes had contributed in any degree to the onset of their condition. These items are not summated, and can be investigated in clusters, although are best explored individually (Moss-Morris et al., 2002).

2.3.4 Hospital Anxiety and Depression Scale (HADS; Snaith & Zigmond, 1994)

The HADS (Appendix 6) is a generic 14 item self-report questionnaire which separately measures the constructs of anxiety and depression. Each item is measured on a 4-point scale assessing severity. Questions relating to anxiety are indicated by an 'A', while depression items are indicated by a 'D'. A cut-off point of 7 for both constructs allows identification of those who are high in anxiety, depression or both. The HADS is a well validated and widely used measure of anxiety and depression with medical patients, without contamination from physical symptomatology (Snaith & Zigmond, 1994). In particular the HADS has been used to assess levels of anxiety and depression in other studies involving cardiology patients, including patients undergoing cardiac surgery (Duits, Boeke, Duivenvoorden *et al.,* 1996), and post MI patients (Bennett, Mayfield, Norman, *et al.,* 1999; Thornton & Hallas, 1999).

2.3.5 Wechsler Test of Adult Reading (WTAR; Wechsler, 2003)

The WTAR (Appendix 7) is a 50 item psychometric test of adult reading which estimates premorbid intellectual ability. Individuals are asked to pronounce test items and are

scored on their accuracy. Scores on the WTAR are combined with demographic information which allows estimation of premorbid scores which correspond to scores on the Wechsler Adult Intelligence Scale – Third Edition. Therefore, this test provides estimated WAIS-III IQ and Index scores. The WTAR was developed specifically to estimate premorbid intellectual functioning in adults aged 16-89. The WTAR was developed and co-normed with the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III; Wechsler, 1997), and its content is based on other reading-recognition tests, including the National Adult Reading Test (Nelson, 1982). The words selected as items in this test do not follow standard grapheme-to-phoneme translation, thus require subjects to have prior experience of these in order to be able to pronounce them. Items in this test represent a full range of ability level and when combined with demographic information, allows an estimation of pre-morbid intellectual ability. The validity of the WTAR has been investigated and found to be acceptable (Wechsler, 2003). This test provided an estimation of intellectual ability for the present study.

2.3.6 Demographic information

Demographic information was collected in a semi-structured questionnaire (Appendix 8) and details gathered included age, gender, education level and length, marital status, occupation (whether manual or non-manual), length of stay in hospital and whether the individual had any previous history of myocardial infarction. Physical health status was assessed by asking whether subjects had been diagnosed with any other health condition and by asking them to rate their health on a 4-point scale with rating options of "very good / good / poor / very poor." These questions ensured that an individual's opinion of their health status was assessed rather than that of medical professionals, in line with the research design of individual self-report and self-perception of illness. A further section assessed current alcohol intake and smoking behaviour which was used to supplement the self-report adherence section, which is discussed below.

2.3.6.1 Heart Health Knowledge Questionnaire

The Heart Health Knowledge section within the semi-structured questionnaire assessed knowledge of lifestyle behaviours conducive to maintaining a healthy heart. Although a literature search was carried out, no accessible standardised questionnaire was located. Therefore in order to assess heart health knowledge, individuals were asked to rate on a 6-point Likert scale, with ratings ranging from "strongly disagree" to "strongly agree" whether various behaviours would promote cardiac health. Following reverse scoring of appropriate items, the items known to either promote or be detrimental to heart health were summated. Scores ranged from 13 to 78, with scores of 52 and above, indicating an adequate understanding of factors which are good for the health of the heart. This score was then taken as an approximation of heart health knowledge.

2.3.6.2 Adherence Scale

Examination of current literature revealed no accessible standardised adherence measure, therefore for the purpose of this study a self-report adherence scale was devised by the author. Subjects were asked about their engagement in various behaviours which are recommended by the Heart Manual. This addressed diet, alcohol intake, smoking behaviour, exercise levels, use of relaxation exercises, and management of stress and anxiety. Subjects were asked to rate on a 100mm linear visual analogue scale, the extent to which they had adopted each of these behaviours. A mark in the centre of the line indicated there had been no improvement or deterioration in a given behaviour (this was awarded a score of 50). If there had been an improvement in this behaviour, in line with Heart Manual recommendations, the individual was asked to mark on the line the extent of improvement in behaviour that had occurred, with scores ranging from 51 to 99, with 99 indicating complete adherence. For example, a smoker who had given up smoking since being given the Heart Manual would be likely to mark towards the end of the line, and would thus score very highly with regard to their adherence with this recommendation. Scores below 50 indicated a deterioration in any behaviour. Thus, any score above 50 indicated improvement in cardiac health promoting behaviours. An overall adherence score was then calculated by taking the mean of the ratings of engagement in these behaviours. Where individuals had never engaged in the risk

behaviour being assessed, (that is, they did not smoke or their alcohol intake was minimal) these sections were omitted from the calculation of their adherence score. For example, a non-smoker who does not drink would not have these sections included in the mean calculation of their adherence behaviour, thus ensuring that where healthy behaviour patterns were already being followed and improvement could not be made, this was taken into account in the overall calculation of a subjects total adherence score.

This questionnaire concluded with an open-ended question allowing individuals to add any further comments which they felt were important regarding their experience of using the Heart Manual.

2.4 Pilot-Test

A pilot-test was carried out in an effort to practise and time the interview procedure, and to verify that all assessment tools and instructions were comprehensible to participants. Two men and 2 women (mean age 62 years, SD 11.37) were recruited from Caithness General, Wick). The interview procedure was completed within 45-60 minutes and the subjects stated that they found the instructions and purpose of the study easy to understand. However, page 2 of the IPQ-R caused difficulty for three of these subjects. Participants had problems remembering what the statement option choices of "strongly disagree, disagree, neither agree nor disagree, agree and strongly agree" were, as they were not reproduced from page 1. Participants found it frustrating to have to keep returning to page 1 to check which column they wished to choose. In the final study, the statement options were copied onto page 2 which eased completion of this questionnaire for other participants.

2.5 Procedure

The researcher assessed participants either in their own home, at their nearest hospital

outpatient department or in the Clinical Psychology Department in Inverness. Location options were chosen by participants to ensure that participation with this study was of least inconvenience to them.

The interview period was set at between 42 days and 356 days after introduction to the Heart Manual programme. This minimum period of 42 days discharge before interview allowed for the Heart Manual 6-week programme to be completed. Furthermore, this interview period of between 42 days and 356 days was deemed acceptable as regimen adherence after MI is found to stabilise approximately 30 days post discharge, with little variation at least 1-year later (Miller, Wikoff, McMahon *et al.,* 1989). Interview within these dates would provide an appropriate reflection of individual adherence at least within this period.

Chapter 3. Results

The analytical strategy will be presented first, followed by the sample characteristics. This chapter will then be concluded with examination of the main hypotheses, research questions, and incidental findings.

3.1 Statistical Analysis

The data were analysed using the Statistical Package for the Social Sciences (SPSS) for Windows (Version 10). The data were checked for departures from normality and when significant skewedness was indicated non-parametric tests were utilised. The strength of association between variables and adherence was examined with Pearson's Product Moment Correlation Coefficient (Pearson's r), Spearman's rho correlations or between subjects Analysis of Variance (ANOVA). The predictive power of the significant variables was examined in combination using stepwise multiple-regression analysis, with total adherence as the dependent variable. Although this multiple-regression was carried out, the small sample size indicates that results from this should be interpreted with caution. The relationship between demographic variables and adherence was investigated using Pearson's r correlational analysis, independent samples t-tests and between subjects ANOVA. Significance was set at $p = 0.05$.

3.2 Sample Characteristics

Data was collected by personal interview from 46 adult post myocardial infarction patients who had previously been admitted to the cardiology unit at either Raigmore Hospital or Caithness General Hospital. Subjects ranged in age from 33 to 81 years (M = 60.89 yrs; SD = 12.34), 34 were male, and 12 were female. Thirty-five completed their education at high school, while 11 had attended further education establishments (5 had attended college and 6 had attended university). Subjects were all white, 35 were married, 3 were divorced, 5 were widowed, 1 was cohabiting and 2 were single. Forty-three had not suffered from a previous heart attack, 3 subjects had had a previous infarction 10, 15 and 29 years previously. None had experience with the Heart Manual

prior to their most recent heart attack. Forty-one had not been diagnosed with any other significant health condition. Concurrent diagnoses in the remaining 5 subjects were diabetes (n = 4) and emphysema (n = 1). Mean duration of stay in hospital following the heart attack was 7.6 days (SD = 3.39), range 2 to 20. The mean period between subjects being provided with the Heart Manual 6-week programme and interview was 164.5 days (SD = 93.00), with a range of 42 to 356 days. Table 1 below summarises the sample characteristics.

Table 1. Demographic characteristics of participants

	Mean (Range)	SD	
Characteristic			
Age of Participants	*60.89yrs (33-81yrs)*	*12..34*	
	N	%	
Gender			
Male	34	74	
Female	12	26	
Education			
High School	35	76	
College	5	11	
University	6	13	
Marital Status			
Married	35	76	
Divorced	3	7	
Widowed	5	11	
Cohabiting	1	2	
Single	2	4	
Heart Attack History			
Previous Heart Attack	3	7	
No Previous MI	43	93	
General Health Status			
Other Health Condition	5	11	(4 diabetes, 1 emphysema)
No Other Conditions	41	89	

3.3 Main Hypotheses and Research Questions

3.3.1a *Hypothesis 1a. It was hypothesised that those with high internal locus of control scores and / or high health value scores would be more adherent with the Heart Manual.*

Spearman's rho correlation was calculated between internal locus of control and adherence and health value and adherence. Tests of normality indicated that the adherence data were normally distributed, but that the internal locus of control and health value data were skewed, therefore non-parametric analyses were indicated in this instance.

As shown in table 2, there was no significant association between internal locus of control and total adherence (rho = 0.020, n = 46, p = 0.897, two-tailed), or between health value and total adherence (rho = 0.153, n = 45, p = 0.315, two-tailed).

Table 2. Correlation coefficients and significance levels for internal locus of control and adherence, and for health value and adherence

	Internal locus of control	Health value
Adherence **Spearman's rho correlation**	+0.020	+0.153
Sig. (2-tailed)	0.897	0.315
N	46	45

Further analysis was indicated as it is argued in the literature that the predictive power of internal locus of control is strengthened when the interaction between internal locus of control and health value is taken into account. Internal health locus of control scores and health value scores were standardised (to accommodate the markedly different ranges of scores) and summated and the relationship between these summated scores and adherence was examined. It was expected that higher scores on this combined variable would be associated with higher adherence. Spearman's rho correlation was used due to the skewed nature of the combined internal locus of control and health value scores.

As is shown in table 3, no significant association was found between combined

internal locus of control scores and health value with adherence (rho = 0.069, n = 45, p = 0.653, two tailed).

Table 3. Correlation coefficient and significance level for combined internal locus of control and health value and adherence

	Combined internal locus of control and health value
Adherence	
Spearman's rho correlation	0.069
Sig. (2-tailed)	0.653
N	45

Hypothesis 1a, that those with high internal locus of control scores and / or high health value scores would be more adherent with the Heart Manual, was therefore not supported. The statistical analysis for Hypothesis 1a, can be found in Appendix 9.

3.3.1b *Hypothesis 1b. It was hypothesised that individuals with high chance health locus of control scores would have lower adherence with the Heart Manual.*

Pearson's correlation was calculated to determine the association between chance health locus of control scores and adherence (Table 4, below).

Table 4. Correlation coefficient and significant level for chance health locus of control and adherence.

	Chance Locus of Control
Adherence	
Pearson r correlation	-0.587
Sig. (2-tailed)	< 0.001*
N	46

*** significant at the 0.001 level**

A significant negative correlation between chance health locus of control and adherence was found (r = -0.587, n = 46, $p < 0.001$, two-tailed) (Appendix 9). This indicates that individuals who believe that their health status is largely determined by chance, fate or luck, are less likely to adhere to the Heart Manual cardiac rehabilitation programme.

In conclusion, Hypothesis 1b, that individuals with higher chance scores would have lower adherence with the Heart Manual was supported.

3.3.2a *Hypothesis 2a. It was hypothesised that adherence to the Heart Manual would be greater in those with higher personal control scores.*

Spearman's rho calculation revealed that there was no significant association between personal control and total adherence (rho = 0.053, n = 46, p = 0.725, two-tailed) (Appendix 10). Table 5 below provides the correlation coefficients and significance level for this analysis.

Table 5. Correlation coefficient and significance level for personal control and adherence.

	Personal Control
Adherence **Pearson r correlation**	0.053
Sig. (2-tailed)	0.725
N	46

Hypothesis 2a, that individuals with higher personal control scores would be more adherent was therefore not upheld.

3.3.2b *Hypothesis 2b. It was hypothesised that higher treatment control scores would be associated with greater adherence to the Heart Manual programme.*

Table 6 below, summarises the Pearson's correlation which revealed no significant association between treatment control and adherence (r = 0.019, 46, p = 0.900, two-tailed) (Appendix 10).

Table 6. Correlation coefficient and significance level for treatment control and adherence.

	Treatment Control
Adherence	
Pearson r correlation	0.019
Sig. (2-tailed)	0.900
N	46

In summary, hypothesis 2b, that individuals with higher treatment control scores would have enhanced adherence was not supported.

3.3.2c *Hypothesis 2c. It was hypothesised that higher illness coherence scores would have enhanced adherence with the Heart Manual.*

As can be seen in Table 7, a significant positive correlation between illness coherence scores and adherence was found ($r = 0.354$, $n = 46$, $p = 0.016$, two-tailed) (Appendix 10). This suggests that individuals who believe they have a good understanding of their illness are more likely to follow the Heart Manual recommendations.

Table 7. Correlation coefficient and significance level for illness coherence and adherence.

	Illness Coherence
Adherence	
Pearson r correlation	0.354
Sig. (2-tailed)	0.016*
N	46

*** Correlation is significant at the 0.05 level.**

Hypothesis 2c, that individuals who had higher illness coherence scores would have higher adherence with the Heart Manual, was therefore upheld.

3.3.2d *Hypothesis 2d. It was hypothesised that those with low illness consequence scores would be less adherent with the Heart Manual.*

To test the prediction that there would be a significant relationship between illness consequence scores and adherence, a one-tailed correlational analysis was carried out.

As can be seen in Table 8, no significant relationship was found between illness consequence scores and adherence (r = 0.244, n = 46, p = 0.102, two-tailed) (Appendix 10).

Table 8. Correlation coefficient and significance level for illness consequence and adherence.

	Illness Consequence
Adherence **Pearson r correlation**	0.244
Sig. (2-tailed)	0.102
N	46

Hypothesis 2d, that individuals with low illness consequence scores would be less adherent, was not supported.

3.3.3a *Hypothesis 3a. It is hypothesised that individuals with high depression scores would be less likely to comply with the Heart Manual.*

Examination of this hypothesis was complicated, both by the low variance in depression scores and by the small number of subjects who had reached clinical 'caseness' for depression. The mean depression score was 2.26 (SD = 2.51); 3 out of the 46 scored in the borderline range; no patient scored within the clinical 'caseness' range; 43 subjects scored within the normal range (Table 9, below).

Table 9. Depression Scores

Depression Scores (n = 46)	
Mean 2.26	**SD** 2.51
Depression Level	**N**
Borderline	3
Mild	0
Normal	43

The number of subjects with depression scores in the clinical range was too few to allow adequate testing of this hypothesis. The depression scores were so heavily skewed that these data could not be regarded as continuous data. The depression scores were therefore subdivided into 3 levels, of no depressive symptoms (Level 1), mild

depression (1 symptom of depression – Level 2), and moderate depression (2 or more depressive symptoms – Level 3), in an effort try and maintain equal numbers in each category. A one-way ANOVA was then carried out between these depression levels and adherence. As can be seen in Table 10 below, no significant relationship was found between adherence and level of depression ($F_{(2,43)} = 0.786, p = 0.462$) (Appendix 11).

Table 10. Analysis of variance investigating relationship between depression level and adherence

	Adherence and Depression Level
Analysis of Variance	$F_{(2,43)} = 0.786, p = 0.462$

Hypothesis 3a, that individuals with high depression scores would be less adherent with the Heart Manual, was therefore not upheld.

3.3.3b *Hypothesis 3b. That high anxiety levels would impact on adherence, by either increasing or decreasing adherence.*

As with the depression scores, examination of this hypotheses was also complicated, both by the low variance in anxiety scores, and by the limited number of subjects who reached clinical 'caseness' for anxiety. The mean anxiety score was 3.85 (SD = 3.48); 8 out of the 46 scored in the borderline range; 1 scored within the clinical "caseness" range; 37 subjects scored within the normal range (Table 11).

Table 11. Anxiety Scores

Anxiety Scores (n = 46)	
Mean 3.85	**SD** 3.48
Anxiety Level	**N**
Borderline	8
Mild	1
Normal	37

Too few subjects reported significant anxiety to allow thorough statistical exploration of any association between anxiety and adherence. The anxiety scores were heavily skewed and thus this data could not be regarded as continuous. Anxiety scores were therefore subdivided into 3 levels, of no anxiety symptoms (Level 1), mild anxiety (1 symptom of anxiety – Level 2), and moderate anxiety (2 or more anxiety symptoms – Level 3), in an

effort to try and maintain equal numbers in each category. An ANOVA was carried out between these anxiety levels and adherence. No significant relationship was found between adherence and level of anxiety ($F_{(2,43)} = 0.090$, $p = 0.914$). (Table 12) (Appendix 11).

Table 12. Analysis of variance investigating relationship between anxiety level and adherence

	Adherence and Anxiety Level
Analysis of Variance	$F_{(2,43)} = 0.090, p = 0.914$

Hypothesis 3b, that high anxiety levels would impact on adherence by either increasing or decreasing adherence was not supported.

3.3.4 *Hypothesis 4. It was hypothesised that individuals with higher scores on measures of intellectual ability would have greater adherence to the Heart Manual.*

Pearson's correlation was calculated between adherence scores and predicted IQ scores obtained from the WTAR: Verbal IQ (VIQ) and Performance IQ (PIQ).

As can be seen in Table 13, relationships between these two WTAR predicted intelligence variables and total adherence, did not reach significance, Verbal IQ (r = 0.236, n = 46, $p = 0.115$, two-tailed); and Performance IQ (r = 0.243, n = 46, $p = 0.104$, two-tailed) (Appendix 12).

Table 13. Correlation coefficients and significance levels for VIQ and PIQ, with Adherence

	Verbal IQ	**Performance IQ**
Adherence **Pearson r correlation**	0.236	0.243
Sig. (2-tailed)	0.115	0.104
N	46	46

Hypothesis 4, that individuals with higher intelligence scores would have greater adherence with the Heart Manual, was therefore not supported.

Table 14 below summarises the correlation coefficients, ANOVA analyses, and significance levels for all hypotheses generated correlational analyses.

Table 14. Summary Table of all Correlational Analyses, ANOVA Results and Significance Levels

Hypotheses	Variable	Correlations with Total Adherence Scores, and ANOVA analyses	Significant
1a	Internal Locus of Control	rho = 0.020, n = 46, $p = 0.897$, two-tailed	NS
1a	Health Value	rho = 0.153, n = 45, $p = 0.315$, two-tailed	NS
1a	Combined Internal Health Locus of Control and Health Value	rho = 0.069, n = 45, $p = 0.653$, two-tailed	NS
1b	Chance Locus of Control	r = -0.587, n = 46, $p < 0.001$, two-tailed	* 0.001 level
2a	Personal Control	rho = 0.053, n = 46, $p = 0.725$, two-tailed	NS
2b	Treatment Control	r = 0.019, n = 46, $p = 0.900$, two-tailed	NS
2c	Illness Coherence	r = 0.354, n = 46, p = 0.016, two-tailed	* 0.05 level
2d	Illness Consequence	r = 0.244, n = 46, $p = 0.102$, two-tailed	NS
3a	HADS – Depression Level	$F_{(2,43)} = 0.786, p = 0.462$	NS
3b	HADS – Anxiety Level	$F_{(2,43)} = 0.090, p = 0.914$	NS
4	WTAR predicted VIQ scores	r = 0.236, n = 46, $p = 0.115$, two-tailed	NS
4	WTAR predicted PIQ scores	r = 0.243, n = 46, $p = 0.104$, two-tailed	NS

In summary, chance health locus of control and illness coherence were the only two variables found to have a significant association with total adherence.

3.3.5 Multiple-Regression

A multiple regression analysis was completed in order to develop a model for predicting adherence. The results of this analysis should be interpreted with some caution due to the small number of subjects included in this study. The predictor variables entered into this analysis included the two variables which were significantly correlated with total adherence (chance health locus of control and illness coherence), and three other

variables whereby the correlations were tending to (but did not reach) significance (Illness consequence and WTAR predicted VIQ and PIQ).

Given that this was an empirical prediction, the stepwise method was used as there were no variables which theoretically would be desirable to retain in the equation if their predictive power was low. Using the stepwise method, the model that emerged included 2 adherence predictor variables: chance health locus of control and illness coherence (Adjusted $R^2 = .458$; $F_{2,43} = 20.0$, $p < 0.001$ (using the stepwise method) (Appendix 13)). Chance locus of control accounted for 33 per cent of the variance, whereas illness coherence accounted for 12 per cent of the variance. Illness consequence and WTAR predicted VIQ and PIQ variables were excluded from this stepwise analysis, as they did not strengthen the model. Significant variables are illustrated in Table 15 below.

Table 15. Multiple Regression

Adjusted $R^2 = .458$; $F_{2,43} = 20.0$, $p < 0.001$ (using the stepwise method)
Significant variables are shown below.

Predictor Variable	**Beta**	***p***
Chance health locus of control	-.597	$p < 0.001$
Illness Coherence	.371	$p = 0.002$

(Illness Consequence, and the WTAR predicted VIQ and PIQ were not significant predictors in this model.)

The conclusion from both the correlational analyses and the multiple regression is that scores on the two subscales of chance health locus of control and illness coherence will allow adherence to be predicted. No significant correlation exists between illness coherence and chance health locus of control, indicating that multicollinearity is not a problem. Therefore, these subscales are both required, on an independent basis, to enhance prediction of adherence to the Heart Manual.

In summary, correlational analyses and multiple regression confirmed that adherence is

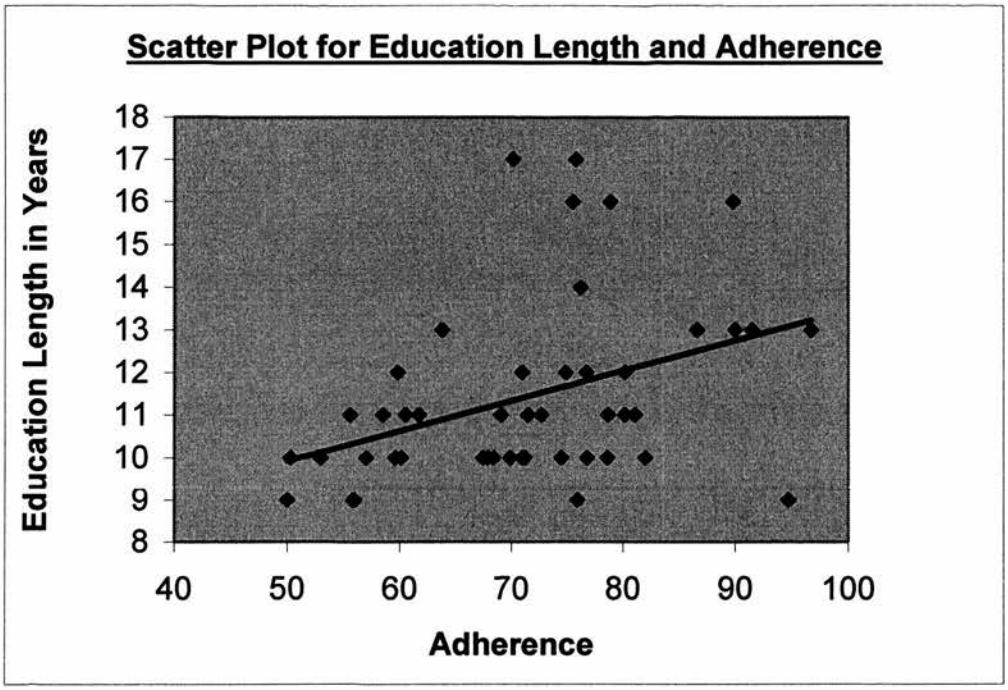
greater in those with low chance locus of control scores and higher illness coherence scores.

3.3.6 Further investigation into the exclusion of WTAR predicted IQ scores

The absence of any significant relationship between the WTAR predicted VIQ and PIQ scores with adherence was unexpected, as the Heart Manual is presented in a book format, which individuals with higher intellectual ability were expected to be more likely to read, and consequently follow, because of their hypothesised familiarity and inclination towards reading and self-learning. This warranted further examination. As the Heart Manual is presented in a book format, it is a verbally based textual medium, which is likely to be more acceptable to people with higher intelligence scores. However, in its textual format, it would also be more familiar to those who have spent a greater number of years being educated at high school, and to those who went onto further education establishments, such as college or university. Therefore it is possible that the important determinant with regard to adherence is not intellectual quotient as such, but familiarity with reading material, which would be expected in those whom had had a greater length of education or who had attended further education establishments. Therefore, a further prediction would suggest that adherence would be greater in those who had spent more years being educated, or in those who had completed higher levels of education.

In order to explore the possibility that education length and level would impact on adherence further investigation was initiated. Initial analysis regarding length of education and education level took the form of scatter plots. A scatter plot between educational length and adherence, with the regression trend line, is illustrated in Figure 1., below.

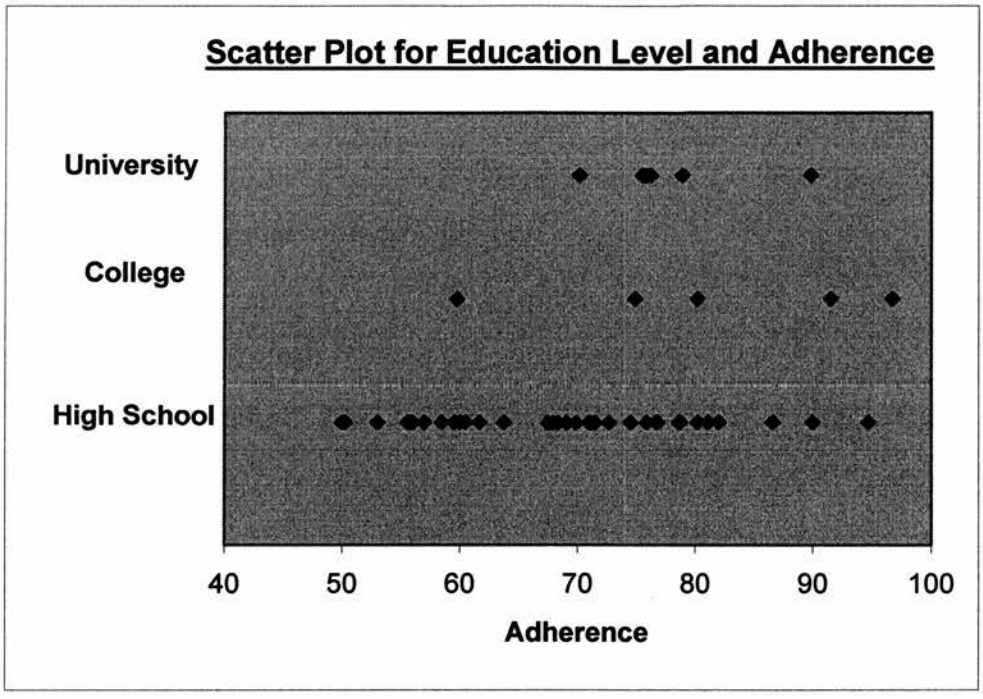
Fig 1. Scatter Plot between Education Length and Adherence



The scatter plot shown in Figure 1. suggests a relationship between number of years in education and adherence. A significant association between the number of years in education and adherence with the Heart Manual was found (rho = 0.427, n = 46, p = 0.003) (Appendix 14). Therefore it appears that individuals who have spent more years being educated are more likely to comply with the Heart Manual.

The relationship between education level and adherence is illustrated graphically in Figure 2., below.

Fig 2. Scatter plot for education level and adherence



The scatter plot shown in Figure 2 suggests that a relationship also exists between education level and adherence. A one-way ANOVA confirmed that there is a significant relationship between level of education and adherence with the Heart Manual ($F_{(2,43)}$ = 3.401, p =.043) (Appendix 15). Therefore it appears that individuals who have spent more years being educated are more likely to comply with the Heart Manual.

Further analysis was then carried out using two-tailed partial correlations investigating the association between predicted IQ levels (VIQ and PIQ) and adherence, while controlling for 1) length of education and 2) educational level (Table 16, below). When education length and education level are controlled for, the correlations between VIQ and PIQ no longer approach significance (Appendix 16).

Table 16. Partial Correlation Coefficient for Verbal IQ and Adherence, and Performance IQ and Adherence, controlling for both Education Length and Education Level.

	Controlling For			
	Educational Length		Educational Level	
	Verbal IQ	Performance IQ	Verbal IQ	Performance IQ
Total Adherence Partial Correlation	0.0200	0.0181	0.0974	0.1004
Sig (two-tailed)	0.896	0.906	0.525	0.512
Df	43	43	43	43

It would seem from these results that the determining factor with regard to adherence is not WTAR predicted IQ level, but education length and education level.

In order to take account of this finding, a second stepwise multiple regression analysis was performed. The predictor variables in this analysis included the two variables which emerged from the first model (chance health locus of control and illness coherence) along with educational length and education level. Using the stepwise method, the model that emerged from this secondary analysis again only included chance health locus of control and illness coherence as predictors of adherence (Adjusted $R^2 = .458$; $F_{2,43} = 20.0$, $p < 0.001$) (Appendix 17). Therefore, despite the significant correlations between length of education and total adherence and education level and total adherence, these variables were not included in the stepwise analysis, as they did not significantly strengthen the model.

Thus the final model to emerge from the stepwise analysis still contains only the two predictor variables identified in the initial analysis of chance health locus of control and illness coherence.

The exclusion of education length and education level from the multiple regression was unexpected because statistically significant relationships were indicated between these two variables and adherence. Figure 1 illustrates that individuals who had spent a greater length of time in education were likely to have higher adherence scores. However, those who had completed fewer years of schooling had greater score variance, with some individuals found to be non-adherent and others strongly adherent. Similarly, Figure 2,

illustrates that individuals who had attended further education establishments tended to have greater adherence, particularly those educated to university level. Those with fewer years of schooling had greater variance in their scores. The relationship between education length and level is complex and appears strongest for predicting adherence levels in those who had an extended education. This is likely to explain why these variables were excluded from the multiple regression.

3.4 Incidental Findings

3.4.1 Demographic correlates of adherence

Investigation into whether certain demographic variables had a relationship with adherence was also intended. Small sample numbers rendered certain investigations impossible. The relationships between adherence in those who had suffered a previous heart attack (n = 3) and those who had not (n = 43); in those with concurrent serious illnesses (n = 5) and those without (n = 41); and those who stated they had received support from significant others (n = 43) and those who did not (n = 3); were unfeasible due to small sample size.

Exploratory data analysis was carried out on relationship between adherence and other variables of age, gender, marital status, occupational status and subjective health status (Appendix 18). There were no significant relationships identified between the demographic variables discussed above and adherence.

The open-ended question which concluded the semi-structured questionnaire was only completed by 3 subjects, all of whom stated how invaluable the Heart Manual had been to their rehabilitation.

In summary, these results suggest that adherence with the Heart Manual can be predicted by use of the Multidimensional Health Locus of Control chance subscale and the Revised Illness Perception Questionnaire illness coherence subscale. Education length and education level also appear to have predictive elements with regards to adherence. These

relationships appear to be quite complex and are not as strong as the chance and illness coherence variables. However, the strongest relationship with adherence was found to be between those who had spent a greater number of years in education or those who were university educated. No significant relationships were identified between demographic variables and adherence.

Chapter 4. Discussion

An overview and discussion of the main findings will be followed by a discussion of the limitations of the study. The chapter will close with recommendations for future research.

4.1 Predictability of Adherence with the Heart Manual

The aim of this study was to explore whether there are identifiable differences between people who comply with the Heart Manual, self-help cardiac rehabilitation programme, and those who have poor adherence. Individuals with lower chance health locus of control scores and those with higher illness coherence scores were found to be more adherent with the Heart Manual. The significant negative relationship between chance health locus of control scores and adherence, and the positive significant relationship between illness coherence scores and adherence were confirmed by correlational analysis and multiple regression when adherence was considered as a continuous variable. Forty-five per cent of the variance was explained by the multiple regression model, with chance health locus of control accounting for 33 per cent of the variance and illness coherence accounting for 12 per cent. The multiple regression results should be interpreted with some caution, due to small sample size in this study.

4.1.1 Chance Health Locus of Control

The finding that higher chance health locus of control scores were associated with lower adherence is in line with the results of other studies which have found that high chance attribution scores in MI patients were negatively associated with adherence to medical advice (Bar-on, 1983). If health status is believed to be largely determined by chance and at the mercy of fate or luck, an individual is likely to respond passively and thus reject recommended behaviour change. Thus they will see little value in engaging in behaviours such as those recommended in cardiac rehabilitation programmes, like the Heart Manual, as they believe the power they have to influence their health status is compromised by the role played by fate. This finding also supports research which reports that those with high external locus of control orientation are less likely to stop smoking (Segall et al.,

1990) and less inclined to exercise (Carlson et al, 1989).

4.1.2 Internal health locus of control

Although other studies have found that individuals who have high internal health locus of control are more likely to engage in behaviours which will improve their health status (Pike et al., 1991), this finding was not upheld in the current study. The failure to find an association between internal locus of control and adherence behaviour in the present study was unexpected. One possible explanation is that the heart attack related adaptation of the MHLC: Form C, may not have been sensitive enough to identify differences in internal locus of control. A second possible explanation is that the profile of those who suffered a heart attack in this study varied, and that this variation did not allow adequate comparisons to be carried out. While some individuals believed their lifestyle had played a significant part in their heart problems, others were aware of a genetic predisposition although medical risk reduction advice had been followed. Also there were some subjects who believed that they had led a relatively healthy lifestyle (such as not smoking, having a low fat diet and taking regular exercise) and their MI was completely unexpected. It is possible that MI survivors' causal attributions are such that those who believe their own behaviour played a part should be considered separately from those who felt their lifestyle did not put them at risk for heart disease. Further study would be necessary in order to investigate whether there are group differences within MI sufferers according to aetiological attribution.

4.1.3 Health Value

The hypothesis that higher health value would be positively associated with adherence was not supported in the present study. This result could be attributed to the fact that there was little variance among health value in this sample. Eighty-three per cent (n = 38) of the total sample of 46 rated health as either the most important or second most important value. Therefore there was too little variance in scores for differences between health value and adherence to be identified. Wallston and Smith (1994) state that health value tends to be high in populations already diagnosed with a health problem. It is

suggested that instead in these populations disease severity should be assessed and the interaction between this and internal locus of control investigated, rather than health value and internal locus of control. Future study would take this recommendation into account when assessing internal locus of control and adherence behaviour.

4.1.4 Illness Coherence

Illness coherence was found to have a positive association with adherence. It would appear that people who have a better understanding of their condition, maybe with a belief that they understand what factors caused their heart problems, why it occurred, and what can be done about it, are more likely to follow the Heart Manual. The impact of increased illness coherence on adherence, reflects Ley's cognitive hypothesis model of adherence which suggests that compliance with medical advice is positively associated with increased understanding and recall of the advice given (Ley, 1988; 1989). The Heart Manual is both instructional and educational and these are factors which are also found to be associated with enhanced adherence (Mullen, Green & Persinger, 1985). This is also in line with other studies which have found that the more explicit medical recommendations were, the more patients complied with the advice (Svarstad, 1976). Therefore it would appear that information provision can enhance adherence.

4.1.5 Personal Control and Treatment Control

Other studies have identified a relationship between beliefs regarding cure and control, and cardiac rehabilitation attendance (Petrie, *et al.,* 1996; Cooper, *et al.,* 1999). This was not replicated in the present study. In many of the other studies investigating the impact of cure and control on health behaviour, the original Illness Perception Questionnaire was used, while in the present study, the more recent Revised Illness Perception Questionnaire (IPQ-R) was utilised. The IPQ-R subdivides the cure and control subscale into personal control and treatment control, and there may be something about the subdivision which has questionnable validity with this sample.

4.1.6 Illness Consequence

The hypothesised relationship between illness consequence and adherence was not supported. Many of the subjects stated that their current health was much improved over what it had been prior to their heart attack and very few were experiencing ongoing symptoms from the MI. It is possible that there are stages which patients go through with regard to how they perceive the consequences of experiencing a MI, with the consequences possibly appearing greater in the early stages when the experience of suffering a major health scare is still vivid. The consequences of having a MI may appear less significant as time passes and they resume normal day to day functioning. If it is indeed the case that illness consequence perceptions after having a heart attack change over time, the impact this could have on adherence would have to be assessed over a much smaller time frame that that of the present study.

4.1.7 Depression and Anxiety

The present study did not identify a negative relationship between high depression scores and adherence. Neither was an association identified between anxiety scores and adherence. However, there were difficulties with the variance of both the depression and anxiety scores, with very few numbers of participants experiencing clinical levels of depression or anxiety. Therefore the hypotheses that higher depression scores are associated with lower adherence, and that anxiety impacts on adherence could not be thoroughly investigated in the present study, and thus remain inconclusive.

In light of the reported 13-19 per cent depression rate in post MI patients (Ladwig *et al.,* 1994; Frasure-Smith *et al.,* 1995a; Breithdardt & Borggrefe, 1991), and the 24 to 31 per cent anxiety rate in those who have suffered a heart attack (Denollet & Brutsaert, 1998; Frasure-Smith *et al.,* 1995; Frasure-Smith *et al.,* 1999) the low numbers of subjects with clinical levels of depression and anxiety in the present study was surprising. It is possible that this may have been a sampling issue. Subjects were approached in the first instance by hospital based cardiac rehabilitation staff and it may be that certain patients were not considered suitable for the study. Thus a sampling bias may have inadvertently occurred.

Future investigation into whether depression and anxiety impact on adherence would have to involve more subjects with anxiety and depression scores through the mild, medium and severe range, in order to investigate the relationship between these factors and adherence with the Heart Manual cardiac rehabilitation programme.

4.1.8 Intelligence Levels

The hypothesis that adherence would increase as predicted intellectual score increased, was not found in the present study. However, further analysis indicated that educational length and educational level appeared to have a degree of predictability with regard to adherence. However, these variables were excluded from a secondary Multiple Regression analysis. The relationship between length and level of education and adherence appeared quite complex. Those who had spent more years being educated tended to have greater adherence and high adherence rates were found in all subjects who had gone to university. However, the relationship between these variables and adherence rate is more complicated for the other groups. With the range of scores greatest in those who had only attended high school or those with fewest years of schooling, see Figure 1 and 2 above. Therefore the predictive value of education length and level, would seem to be heightened for the more educated subsection of the population, particularly in the university educated subjects. This complex relationship probably accounts for the exclusion of these two variables from the secondary multiple regression. The greater adherence among those individuals who had spent more time in education is likely to be due to their familiarity with literary material. It would appear that that the important determinant with regard to adherence with the Heart Manual is familiarity with reading and self-learning material. However, this is a tentative hypothesis due to the small number of subjects who had attended college or university, five and six respectively. Further study would again be necessary to further investigate this finding.

4.2 Clinical Implications

The finding that adherence was significantly associated with both chance health locus of control scores and illness coherence is important clinically as this implies that it is

possible to predict those less likely to adhere to the Heart Manual programme. Identification of these individuals is essential as low adherence rates puts these patients at risk of poor management and recovery from their heart attack. Those individuals deemed to be at risk of non-adherence could be targeted with interventions designed to enhance compliance with cardiac rehabilitation programmes such as the Heart Manual.

The finding of an association between adherence and educational length and level is also important as it raises questions as to the appropriateness, for certain populations, of a verbally mediated textual medium, like the Heart Manual.

4.3 Demographic Correlates of Adherence

There were no significant relationships identified between the demographic variables of age, gender, marital status, occupational status and subjective health status. Statistical analysis investigating the relationships between certain demographic categories were unfeasible due to small sample size.

4.4 Limitations of the Present Study

This study did not examine the independent factors prior to introduction to the Heart Manual. Future research would have to follow a prospective design, in order to fully examine whether chance health locus of control and illness coherence scores identified immediately following the heart attack are predictive of subsequent adherence with cardiac rehabilitation recommendations.

Studies investigating adherence with medical regimens are often criticised because of the inherent difficulty in both defining and measuring adherence. Limitations were found in the adherence measure which was designed specifically for this study. The measure was a self-report visual analogue scale which asked patients to rate their compliance with various health behaviours. This scale was unstandardised and with hindsight, the instructions could have been difficult to understand had the researcher not been present to explain how the scale was to be completed.

Another difficulty identified with the adherence scale was that some of the subjects also stated that their adherence with cardiac promoting behaviours had either been life-long, or had begun before they were provided with the Heart Manual, when a genetic or individual health predisposition to heart disease had been identified. Thus their engagement in risk reducing behaviours would not have increased significantly with the introduction of the Heart Manual. Their true adherence level would have been masked by the fact they were already following cardiac risk reduction advice. Efforts were made to accommodate such individual differences, for example, for non-smokers and for those with minimal alcohol intake, the smoking and alcohol questions were excluded from the computation of mean total adherence scores. However, this may not have been enough to counterbalance the differences between those who were already leading healthy lifestyles and those who were not. Thus, if the high internal locus of control individuals in this study were already engaging in health promoting behaviour, the adherence measure used in this study may have masked their true adherence behaviour. Consequently any relationship between internal locus of control and adherence would not have been identified. Furthermore the assessment of adherence in this study may not have been sensitive enough to assess differences in adherence. Therefore, a flaw in this current study may have been the method of assessing compliance behaviour.

The method of data collection for the study as a whole was by self-report questionnaires and it is recognised that self-report has limitations as it relies on subjective information which may be open to patient bias. Another difficulty with self-report is that these are also susceptible to the social desirability response bias (Edwards, 1957), which implies responding in a way that is expected to be viewed favourably by others. This is a particular concern with regard to the adherence scale, as difficulties in self-report health behaviour have been identified with other health conditions (Hebert, Clemow, Pbert, *et al.,* 1995). However, despite the limitations of self-report it was felt that this was the only viable way to assess adherence behaviours in this particular study.

Assessment of subjects attitude towards reading, their ability and reading skill may have allowed greater prediction of adherence for all subjects, rather than general length and level of education. This could also be considered in future studies of adherence with literary based programmes like the Heart Manual.

As discussed earlier, due to the small number of subjects who were experiencing clinical levels of anxiety and depression, it was not possible to adequately test whether there were associations between anxiety and compliance, and depression and compliance. Thus these hypotheses remain inconclusive and are another limitation of this study. It may have been that the small number of depressed and anxious subjects was an artefact of the relatively small number of individuals involved in the study. Alternatively it is possible that some selection bias occurred due to the method of subject recruitment which involved potential participants being approached in the first instance by cardiac staff. It may have been that the cardiac nurses did not consider patients who were anxious or low in mood as appropriate subjects for the study and therefore did not ask these individuals whether they would be willing to participate. Future research would involve ensuring that the possibility of sampling error was minimised.

4.5 Conclusions and Recommendations for Future Research

In conclusion, the findings from this study indicate that adherence with the Heart Manual cardiac rehabilitation programme can be moderately predicted. Adherence behaviours were found to be higher in those individuals who had lower chance health locus of control scores and higher illness coherence scores. Future research could explore whether these two subscales can be used prospectively to predict adherence with the Heart Manual. Further study could then investigate the efficacy of interventions (such as modification of chance health locus of control beliefs and enhancing heart attack knowledge and understanding) which may enhance adherence to the Heart Manual.

Further research such as is suggested above would contribute to the understanding of factors which affect adherence with the Heart Manual. Enhanced compliance to this programme would optimise cardiac rehabilitation outcome and subsequent morbidity and mortality from heart related conditions could be reduced.

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Appendix 1

Information Sheet

Highland Primary Care NHS Trust

Area Clinical Psychology Service
New Craigs
6-16 Leachkin Road
Inverness IV3 8NP
Telephone 01463 704683
Fax 01463 704686

NHS Highland

PARTICIPANT INFORMATION SHEET

Cardiac rehabilitation is said to have benefits for individuals like yourself who have suffered a heart attack, but people vary in their involvement in cardiac rehabilitation programmes.

This study aims to look at why the Heart Manual cardiac rehabilitation programme is followed closely by some people and much less so by others. The information you provide will help us to improve the service to patients such as yourself.

Participation in this study involves a one-session interview where you will be asked to complete 6 questionnaires. The interview is expected to take approximately 60 minutes and will take place in a location which is convenient for you, this will be discussed when the interview is arranged. All the information that you provide will be confidential and would only be discussed with your doctor if you agree to this.

The medical treatment you receive, either current or subsequent, will not be affected by your participation in this study. Similarly, if you decide not to participate or wish to withdraw from participation in this study, your are free to do so at any time, without giving an explanation, and your treatment as a current or subsequent patient would not be affected in any way.

If you wish to discuss this study in any further detail, please discuss this with the cardiac rehabilitation nurse who initially discussed this study with you. Mr Mike McGivern, cardiac rehabilitation nurse at Caithness General Hospital can be contacted on 01955 605050, or Ms Helen Corrigall, cardiac rehabilitation co-ordinator at Raigmore Hospital can be contacted on 01463 704554.

Appendix 2

Consent Form

Highland Primary Care NHS Trust

Area Clinical Psychology Service
New Craigs
6-16 Leachkin Road
Inverness IV3 8NP
Telephone 01463 704683
Fax 01463 704686

NHS Highland

PATIENT CONSENT FORM

I have read the above participant information sheet, I have received a copy for my own information and I understand the purpose of the study.

I am willing to participate in the above study:

Name_____

Signature_____

Date _____

Researcher:

Name_____

Signature_____

Date_____

Appendix 3

Multidimensional Health Locus of Control Questionnaire

MULTIDIMENSIONAL HEALTH LOCUS OF CONTROL (FORM C)

Form C

Instructions: Each item below is a belief statement about your medical condition with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you agree or disagree with that statement. The more you agree with a statement, the higher will be the number you circle. The more you disagree with a statement, the lower will be the number you circle. Please make sure that you answer **EVERY ITEM** and that you circle **ONLY ONE** number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

1 = STRONGLY DISAGREE **(SD)**	4 = SLIGHTLY AGREE **(A)**
2 = MODERATELY DISAGREE **(MD)**	5 = MODERATELY AGREE **(MA)**
3 = SLIGHTLY DISAGREE **(D)**	6 = STRONGLY AGREE **(SA)**

		SD	MD	D	A	MA	SA
1	If my heart condition worsens, it is my own behaviour which determines how soon I will feel better again.	1	2	3	4	5	6
2	As to my heart condition, what will be will be	1	2	3	4	5	6
3	If I see my doctor regularly, I am less likely to have problems with my heart condition.	1	2	3	4	5	6
4	Most things that affect my heart condition happen to me by chance.	1	2	3	4	5	6
5	Whenever my heart condition worsens, I should consult a medically trained professional.	1	2	3	4	5	6
6	I am directly responsible for my heart condition getting better or worse.	1	2	3	4	5	6
7	Other people play a big role in whether my heart condition improves, stays the same, or gets worse.	1	2	3	4	5	6
8	Whatever goes wrong with my heart condition is my own fault.	1	2	3	4	5	6
9	Luck plays a big part in determining how my heart condition improves.	1	2	3	4	5	6
10	In order for my heart condition to improve, it is up to other people to see that the right things happen.	1	2	3	4	5	6
11	Whatever improvement occurs with my heart condition is largely a matter of good fortune.	1	2	3	4	5	6
12	The main thing which affects my heart condition is what I myself do.	1	2	3	4	5	6
13	I deserve the credit when my heart condition improves and the blame when it gets worse.	1	2	3	4	5	6
14	Following doctor's orders to the letter is the best way to keep my heart condition from getting any worse.	1	2	3	4	5	6
15	If my heart condition worsens, it's a matter of fate.	1	2	3	4	5	6
16	If I am lucky, my heart condition will get better.	1	2	3	4	5	6
17	If my heart condition takes a turn for the worse, it is because I have not been taking proper care of myself.	1	2	3	4	5	6
18	The type of help I receive from other people determines how soon my heart condition improves.	1	2	3	4	5	6

Appendix 4

Value Survey

VALUE SURVEY

INSTRUCTIONS: Below you will find a list of 10 values listed in alphabetical order. We would like you to arrange them in order of their importance to YOU, as guiding principles in YOUR life.

Study the list carefully and pick out the one value which is the most important for you. Write the number "1" in the space to the left of the most important value. Then pick out the value which is the second most important to you. Write the number "2" in the space to the left. Then continue in the same manner for the remaining values until you have included all ranks from 1 to 10. Each value would have a different rank.

We realize that some people find it difficult to distinguish the importance of some of these values. Do the best that you can, but please rank all 10 of them. The end result should truly show how YOU really feel.

_____ A COMFORTABLE LIFE (a prosperous life)

_____ AN EXCITING LIFE (a stimulating, active life)

_____ FREEDOM (independence, free choice)

_____ HAPPINESS (contentedness)

_____ HEALTH (physical and mental well-being)

_____ INNER HARMONY (freedom from inner conflict)

_____ PLEASURE (an enjoyable, leisurely life)

_____ SELF-RESPECT (self-esteem)

_____ A SENSE OF ACCOMPLISHMENT (lasting contribution)

_____ SOCIAL RECOGNITION (respect, admiration)

Appendix 5

Revised Illness Perception Questionnaire

ILLNESS PERCEPTION QUESTIONNAIRE (IPQ-R)

Name..... *Date*.....

YOUR VIEWS ABOUT YOUR ILLNESS

Listed below are a number of symptoms that you may or may not have experienced since your illness. Please indicate by circling *Yes* or *No*, whether you have experienced any of these symptoms since your illness, and whether you believe that these symptoms are related to your illness.

	I have experienced this symptom *since my illness*			This symptom is *related to my illness*	
Pain	**Yes**	**No**	_____	**Yes**	**No**
Sore Throat	**Yes**	**No**	_____	**Yes**	**No**
Nausea	**Yes**	**No**	_____	**Yes**	**No**
Breathlessness	**Yes**	**No**	_____	**Yes**	**No**
Weight Loss	**Yes**	**No**	_____	**Yes**	**No**
Fatigue	**Yes**	**No**	_____	**Yes**	**No**
Stiff Joints	**Yes**	**No**	_____	**Yes**	**No**
Sore Eyes	**Yes**	**No**	_____	**Yes**	**No**
Wheeziness	**Yes**	**No**	_____	**Yes**	**No**
Headaches	**Yes**	**No**	_____	**Yes**	**No**
Upset Stomach	**Yes**	**No**	_____	**Yes**	**No**
Sleep Difficulties	**Yes**	**No**	_____	**Yes**	**No**
Dizziness	**Yes**	**No**	_____	**Yes**	**No**
Loss of Strength	**Yes**	**No**	_____	**Yes**	**No**

We are interested in your own personal views of how you now see your current illness.

Please indicate how much you agree or disagree with the following statements about your illness by ticking the appropriate box.

	VIEWS ABOUT YOUR ILLNESS	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP1*	My illness will last a short time					
IP2	My illness is likely to be permanent rather than temporary					
IP3	My illness will last for a long time					
IP4*	This illness will pass quickly					
IP5	I expect to have this illness for the rest of my life					
IP6	My illness is a serious condition					

		STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP7	My illness has major consequences on my life					
IP8*	My illness does not have much effect on my life					
IP9	My illness strongly affects the way others see me					
IP10	My illness has serious financial consequences					
IP11	My illness causes difficulties for those who are close to me					
IP12	There is a lot which I can do to control my symptoms					
IP13	What I do can determine whether my illness gets better or worse					
IP14	The course of my illness depends on me					
IP15*	Nothing I do will affect my illness					
IP16	I have the power to influence my illness					
IP17*	My actions will have no affect on the outcome of my illness					
IP18*	My illness will improve in time					
IP19*	There is very little that can be done to improve my illness					
IP20	My treatment will be effective in curing my illness					
IP21	The negative effects of my illness can be prevented (avoided) by my treatment					
IP22	My treatment can control my illness					
IP23*	There is nothing which can help my condition					
IP24	The symptoms of my condition are puzzling to me					
IP25	My illness is a mystery to me					
IP26	I don't understand my illness					
IP27	My illness doesn't make any sense to me					
IP28*	I have a clear picture or understanding of my condition					
IP29	The symptoms of my illness change a great deal from day to day					
IP30	My symptoms come and go in cycles					
IP31	My illness is very unpredictable					
IP32	I go through cycles in which my illness gets better and worse.					
IP33	I get depressed when I think about my illness					
IP34	When I think about my illness I get upset					
IP35	My illness makes me feel angry					
IP36*	My illness does not worry me					
IP37	Having this illness makes me feel anxious					
IP38	My illness makes me feel afraid					

CAUSES OF MY ILLNESS

We are interested in what <u>you</u> consider may have been the cause of your illness. As people are very different, there is no correct answer for this question. We are most interested in your own views about the factors that caused your illness rather than what others including doctors or family may have suggested to you. Below is a list of possible causes for your illness. Please indicate how much you agree or disagree that they were causes for you by ticking the appropriate box.

	POSSIBLE CAUSES	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
C1	Stress or worry					
C2	Hereditary - it runs in my family					
C3	A Germ or virus					
C4	Diet or eating habits					
C5	Chance or bad luck					
C6	Poor medical care in my past					
C7	Pollution in the environment					
C8	My own behaviour					
C9	My mental attitude e.g. thinking about life negatively					
C10	Family problems or worries caused my illness					
C11	Overwork					
C12	My emotional state e.g. feeling down, lonely, anxious, empty					
C13	Ageing					
C14	Alcohol					
C15	Smoking					
C16	Accident or injury					
C17	My personality					
C18	Altered immunity					

In the table below, please list in rank-order the three most important factors that you now believe caused <u>YOUR illness.</u> You may use any of the items from the box above, or you may have additional ideas of your own.

The most important causes for me:-

1. _____
2. _____
3. _____

Appendix 6

Hospital Anxiety and Depression Scale

Hospital Anxiety and Depression Scale (HADS)

NFER-NELSON
INFORMING YOUR DECISIONS

Name: _____ Date: _____

FOLD HERE

Clinicians are aware that emotions play an important part in most illnesses. If your clinician knows about these feelings he or she will be able to help you more.

This questionnaire is designed to help your clinician to know how you feel. Read each item below and **underline the reply** which comes closest to how you have been feeling in the past week. Ignore the numbers printed at the edge of the questionnaire.

Don't take too long over your replies, your immediate reaction to each item will probably be more accurate than a long, thought-out response.

FOLD HERE

A	D		A	D
		I feel tense or 'wound up'		
3		Most of the time		
2		A lot of the time		
1		From time to time, occasionally		
0		Not at all		
		I still enjoy the things I used to enjoy		
	0	Definitely as much		
	1	Not quite so much		
	2	Only a little		
	3	Hardly at all		
		I get a sort of frightened feeling as if something awful is about to happen		
3		Very definitely and quite badly		
2		Yes, but not too badly		
1		A little, but it doesn't worry me		
0		Not at all		
		I can laugh and see the funny side of things		
	0	As much as I always could		
	1	Not quite so much now		
	2	Definitely not so much now		
	3	Not at all		
		Worrying thoughts go through my mind		
3		A great deal of the time		
2		A lot of the time		
1		Not too often		
0		Very little		
		I feel cheerful		
	3	Never		
	2	Not often		
	1	Sometimes		
	0	Most of the time		
		I can sit at ease and feel relaxed		
0		Definitely		
1		Usually		
2		Not often		
3		Not at all		
		I feel as if I am slowed down		
		Nearly all the time		3
		Very often		2
		Sometimes		1
		Not at all		0
		I get a sort of frightened feeling like 'butterflies' in the stomach		
		Not at all	0	
		Occasionally	1	
		Quite often	2	
		Very often	3	
		I have lost interest in my appearance		
		Definitely		3
		I don't take as much care as I should		2
		I may not take quite as much care		1
		I take just as much care as ever		0
		I feel restless as if I have to be on the move		
		Very much indeed	3	
		Quite a lot	2	
		Not very much	1	
		Not at all	0	
		I look forward with enjoyment to things		
		As much as I ever did		0
		Rather less than I used to		1
		Definitely less than I used to		2
		Hardly at all		3
		I get sudden feelings of panic		
		Very often indeed	3	
		Quite often	2	
		Not very often	1	
		Not at all	0	
		I can enjoy a good book or radio or television programme		
		Often		0
		Sometimes		1
		Not often		2
		Very seldom		3

Now check that you have answered all the questions

A	D
TOTAL	

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Appendix 7

Wechsler Test of Adult Reading

WTAR UK

WECHSLER® TEST OF ADULT READING™

Record Form

Name: _____

Sex: ☐ F ☐ M Race/Ethnicity: _____ Education: _____

Examiner: _____

	Year	Month	Day
Date of Testing			
Date of Birth			
Age at Testing			

WTAR Scores

Predicted–Actual Comparison		Serial Assessment*	
Standard Score (Appendix A)		Time 2 Standard Score	
Demographics–Predicted Score (Appendix B)		Time 1 Standard Score	
Prediction Interval ☐ 90% ☐ 95%	–	Time 2 – Time 1 Difference	
Actual–Predicted Difference**		Statistical Significance (Table H.2) ☐ .01 ☐ .05	☐Yes ☐No
Cumulative Percentage*** (Table I.1)		Cumulative Percentage*** (Table H.4)	
>50%	☐	>50%	☐
25%–49%	☐	25%–49%	☐
10%–24%	☐	10%–24%	☐
5%–9%	☐	5%–9%	☐
2%–4%	☐	2%–4%	☐

* US Test–Retest Data is used for Serial Assessment

** If the difference ranges from -15 to -19, use cautiously with demographics to predict intellectual and memory functioning. If the predicted WTAR score is more than 20 points greater than the actual score, do not use WTAR score to predict intellectual or memory performance.

*** Increased shading denotes increasing probability of a clinically significant difference.

WAIS–III^{UK} IQ Scores

☐ **Demographics Predicted** (Appendix C) ☐ **WTAR Predicted** (Appendix D) ☐ **WTAR–Demographics Predicted** (Appendix G)

	VIQ	PIQ	FSIQ
Actual WAIS–III^{UK} Score			
Predicted WAIS–III^{UK} Score			
Prediction Interval ☐ 90% ☐ 95%	—	—	—
Actual-Predicted Difference			
Statistical Significance (Appendix I) ☐ .01 ☐ .05	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No
Cumulative Percentage* (Appendix I)			
>50%	☐	☐	☐
25%-49%	☐	☐	☐
10%-24%	☐	☐	☐
5%-9%	☐	☐	☐
2%-4%	☐	☐	☐

* Increased shading denotes increasing probability of a clinically significant difference. Demographics Predicted - Cumulative Percentages only available for US data use UK WTAR or WTAR Demographics Predicted (I3, I5)

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A B C D E F

WAIS–III^{UK} Index Scores

☐ **Demographics Predicted-VCI Only** (Appendix C) ☐ **WTAR Predicted** (Appendix D) ☐ **WTAR–Demographics Predicted** (Appendix G)

	VCI	POI	WMI	PSI
Actual WAIS–III^{UK} Score				
Predicted WAIS–III^{UK} Score				
Prediction Interval ☐ 90% ☐ 95%	—	—	—	—
Actual–Predicted Difference				
Statistical Significance ☐ .01 ☐ .05 (Appendix I)	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No
Cumulative Percentage* (Appendix I)				
>50%	☐	☐	☐	☐
25%–49%	☐	☐	☐	☐
10%–24%	☐	☐	☐	☐
5%–9%	☐	☐	☐	☐
2%–4%	☐	☐	☐	☐

* Increased shading denotes increasing probability of a clinically significant difference. Demographics Predicted - Cumulative Percentages only available for US data use UK WTAR or WTAR Demographics Predicted (I3, I5)

WMS–III^{UK} Index Scores

☐ **WTAR Predicted** (Appendix D) ☐ **WTAR–Demographics Predicted** (Appendix G)

	Immediate Memory	General Memory	Working Memory
Actual WMS–III^{UK} Score			
Predicted WMS–III^{UK} Score			
Prediction Interval ☐ 90% ☐ 95%	—	—	—
Actual–Predicted Difference			
Statistical Significance ☐ .01 ☐ .05 (Appendix I)	☐Yes ☐No	☐Yes ☐No	☐Yes ☐No
Cumulative Percentage* (Appendix I)			
>50%	☐	☐	☐
25%–49%	☐	☐	☐
10%–24%	☐	☐	☐
5%–9%	☐	☐	☐
2%–4%	☐	☐	☐

* Increased shading denotes increasing probability of a clinically significant difference. Demographics Predicted - Cumulative Percentages only available for US data use UK WTAR or WTAR Demographics Predicted (I3, I5)

N.B. There is no audiotape for UK pronunciation.

Score Summary

Name: _____ Age: _____

Sex: ☐ F ☐ M Race/Ethnicity: _____ Education: _____

WTAR Scores

Standard Score	Predicted Score	Prediction Interval	Actual–Predicted Difference	Cumulative Percentage Range
		——		

Serial Assessment*

Time 2 Standard Score	Time 1 Standard Score	Time 2 – Time 1 Difference	Statistical Significance ☐ .01 ☐ .05	Cumulative Percentage Range
			Yes No	

WAIS–III^{UK} Scores

	Actual Score	Predicted Score	Prediction Interval ☐90% ☐95%	Actual–Predicted Difference	Statistical Significance ☐ .01 ☐ .05	Cumulative Percentage Range
VIQ			—		Yes No	
PIQ			—		Yes No	
FSIQ			—		Yes No	
VCI			—		Yes No	
POI			—		Yes No	
WMI			—		Yes No	
PSI			—		Yes No	

WMS–III^{UK} Scores

Immediate Memory			—		Yes No	
General Memory			—		Yes No	
Working Memory			—		Yes No	

Diagnostic History: _____

Major Complaints: _____

Current Medications: _____

Test-Taking Behaviours: _____

* N.B. Uses US data for Test Retest Data

WTAR Word List - UK pronunciation guide

Say, **I will show you some words that I will ask you to pronounce.** Place the WTAR Word Card in front of the examinee. As you point to the card, say, **Beginning with the first word on the list, pronounce each word aloud. Start with this word** (point to item 1), **and go down this column, one after the other, without skipping any. When you finish this column, go to the next column** (point to the second column). **Pronounce each word even if you are unsure. Do you understand?** When you are sure that the examinee understands the task, say, **Ready? Begin.**

	Item	Pronunciation	Score (0, 1)		Item	Pronunciation	Score (0, 1)
1.	again	ah-GEHN ah-GAIN *or* uh-GEHN or uh-GAIN		26.	conscientious	con-shee-EN-shss	
2.	address	ah-DRESS *or* uh-DRESS		27.	homily	HOM-ih-lay *or* HOM-ih-lee	
3.	cough	kawf *or* kof		28.	malady	MAL-uh-day *or* MAL-uh-dee	
4.	preview	PREE-vyue		29.	subtle	SUH-tl	
5.	although	awl-THO		30.	fecund	FE-cund *or* FEE-cund	
6.	most	mohst		31.	palatable	PAL-ah-tuh-bul *or* PAL-uh-tuh-bul	
7.	excitement	eck-SITE-munt *or* ik-SITE-munt		32.	menagerie	meh-NA-juh-ree	
8.	know	noh *or* no		33.	obfuscate	OB-fuh-skate	
9.	plumb	plum		34.	liaison	lee-AY-zon *or* lee-AY-zn	
10	decorate	DEK-oh-rate *or* DEK-uh-rate		35.	exigency	eks-IH-jen-say *or* eks-IH-jen-see	
11.	fierce	fee-us *or* feerss		36.	xenophobia	zen-oh-FO-bee-uh	
12.	knead	need		37.	ogre	OH-gur	
13.	aisle	iyle		38.	scurrilous	SKUR-ih-lus *or* SKUR-uh-lus	
14.	vengeance	VEN-jnss		39.	ethereal	ih-THEE-ree-ul *or* ih-THEER-ee-ul	
15.	prestigious	pre-STIJ-us *or* pre-STEEJ-us		40.	paradigm	PAH-rah-dime	
16.	wreathe	reeTH		41.	perspicuity	per-spuh-KYEW-uh-tee	
17.	gnat	nat		42.	plethora	PLETH-oh-rah *or* PLETH-eh-rah	
18.	amphitheatre	AM-fih-thee-uh-ter		43.	lugubrious	loo-GOOB-ree-uss *or* loo-GOO-bree-uss	
19.	lieu	loo *or* l(y)oo		44.	treatise	TREE-tiz *or* TREET-iz	
20.	grotesque	gro-TESK		45.	dilettante	DILL-ih-tan-tay *or* DILL-uh-tahnt	
21.	iridescent	ihr-ih-DESS-unt *or* ihr-uh-DESS-unt		46.	vertiginous	ver-TIDJ-in-iss	
22.	ballet	BA-lay *or* ba-LAY *or* bal-ay		47.	ubiquitous	you-BIC-wuh-tiss *or* you-BIC-wuh-tus	
23.	equestrian	eh-KWESS-tree-un *or* ih- KWESS-tree-un		48.	hyperbole	hy-PER-bul-lay *or* hy-PUR-bul-lay	
24.	porpoise	PAW-pss *or* POR-poyz (Scots)		49.	insouciant	in-SOO-see-yunt	
25.	aesthetic	ess-THET-ik *or* ees-THET-ik		50.	hegemony	heh-GEM-o-nee *or* heh-JEM-o-nee *or* HEH-geh-mon-ee	

WTAR Raw Score	
WTAR Standard Score	

Appendix 8

Semi-structured Questionnaire

SEMI-STRUCTURED QUESTIONNAIRE

1) DEMOGRAPHICS

Name _____

Age _____yrs Male / Female (please circle as appropriate)

Age left school _____ yrs

Education completed at **High School / College / University** (please circle as appropriate)

Qualifications _____

Marital status **single / married /co-habiting / separated / divorced / widowed**

What is/was your occupation_____

Type of work **manual / desk job**

2) ADMISSION TO HOSPITAL

How long were you in hospital following your heart attack _____

Have you had any previous heart attacks?_____

How would your rate your health **very good / good / poor / very poor**

Which hospital were you admitted to following your heart attack? **Raigmore / Wick General**

Have you been diagnosed with any other health condition, if so please detail below

_____

3) HEALTH BEHAVIOUR

Previous Smoker **yes / no** Currently smoking **yes / no**

Alcohol intake, please describe alcohol consumed over the previous 7 days over the course of whole day: e.g. 1 glass wine/beer

Monday _____

Tuesday_____

Wednesday_____

Thursday_____

Friday_____

Saturday_____

Sunday_____

4) HEART HEALTH QUESTIONNAIRE

Please rate your understanding of whether the following factors are good for the health of your heart.

High stress levels	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Having a bath	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Relaxing i.e. listening to music	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Drinking alcohol	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Washing the car	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Smoking	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Eating fatty foods	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Being overweight	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Reading a book	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
High cholesterol levels	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
High blood pressure	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Lack of exercise	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Taking heart medication i.e. ACE inhibitors Asprin, Beta-blockers	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree

Worry or anxiety	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Depression	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Watching Television	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree
Family history of heart problems	strongly disagree	somewhat disagree	slightly disagree	slightly agree	somewhat agree	strongly agree

5) HEART MANUAL

Below are a few questions about the Heart Manual Rehabilitation Programme, please indicate your experience of this self-help programme.

Since being given the Heart Manual have you felt that you are more knowledgeable about how the heart works and about what can be done to reduce your risk of further heart problems **yes / no**

Since being given the Heart Manual have you made any of the following changes to your lifestyle? If there has been no change in these factors, please indicate this with a cross in the middle of the line.

1 Diet

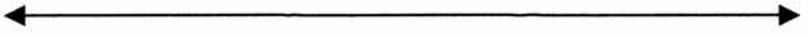
Less healthy — More healthy

2 Alcohol

Intake increased 2+ units per day — Intake decreased, less than 2 units per day

3 Smoking

Increased — Decreased



4 Exercise

Taking less exercise — Taking more/daily exercise

5 Relaxation Exercises

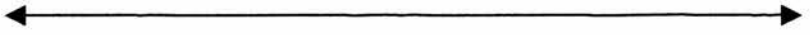
Never — Daily

6 Stress

Less able to control — More able to control

7 Worry

Less able to control — More able to control



6) SIGNIFICANT OTHERS

Please circle as appropriate your experience of the following issues:-

1. I received encouragement from my family/friends to participate with the Heart Manual programme **yes / no**

2. My family/friends attitude towards my use of the Heart Manual felt **supportive / interfering / *unhelpful / *dismissive /*other**

*** Please give more information on this**_____

_____

3. My family have participated with some sections of the Heart Manual, i.e. the exercise programme, healthier eating, relaxation, stress management etc ***yes / no**

*** If yes please detail which section(s)**_____

Any other comments which relate to your experience of using the Heart Manual_____

_____

_____

_____

_____

_____

Appendix 9

Statistical Analysis for Hypothesis 1a and 1b

Statistical Analysis for Hypothesis 1a

Internal Locus of Control and Compliance

Nonparametric Correlations

Correlations

			Internal Locus of Control	Compliance
Spearman's rho	Internal Locus of Control	Correlation Coefficient	1.000	.020
		Sig. (2-tailed)	.	.897
		N	46	46
	Compliance	Correlation Coefficient	.020	1.000
		Sig. (2-tailed)	.897	.
		N	46	46

Statistical Analysis for Hypothesis 1a

Health Value and Compliance

Nonparametric Correlations

Correlations

			Health Value	Compliance
Spearman's rho	Health Value	Correlation Coefficient	1.000	.153
		Sig. (2-tailed)	.	.315
		N	45	45
	Compliance	Correlation Coefficient	.153	1.000
		Sig. (2-tailed)	.315	.
		N	45	46

Statistical Analysis for Hypothesis 1a

Combined Internal Health Locus of Control and Health Value, and Compliance

Nonparametric Correlations

Correlations

			Combined Internal Health Locus of Control & Health Value	Compliance
Spearman's rho	Combined Internal Health Locus of Control & Health Value	Correlation Coefficient	1.000	.069
		Sig. (2-tailed)	.	.653
		N	45	45
	Compliance	Correlation Coefficient	.069	1.000
		Sig. (2-tailed)	.653	.
		N	45	46

Statistical Analysis for Hypothesis 1b

Chance Health Locus of Control and Compliance

Correlations

Correlations

		Chance Health Locus of Control	Compliance
Chance Health Locus of Control	Pearson Correlation	1.000	-.587**
	Sig. (2-tailed)	.	.000
	N	46	46
Compliance	Pearson Correlation	-.587**	1.000
	Sig. (2-tailed)	.000	.
	N	46	46

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 10

Statistical Analysis for Hypothesis 2a, 2b, 2c and 2d

Statistical Analyses for Hypotheses 2a, 2b and 2c

Personal Control, Treatment Control and Illness Coherence with Compliance

Nonparametric Correlations

Correlations

			Personal Control	Compliance
Spearman's rho	Personal Control	Correlation Coefficient	1.000	.053
		Sig. (2-tailed)	.	.725
		N	46	46
	Compliance	Correlation Coefficient	.053	1.000
		Sig. (2-tailed)	.725	.
		N	46	46

Correlations

Correlations

		Treatment Control	Compliance
Treatment Control	Pearson Correlation	1.000	.019
	Sig. (2-tailed)	.	.900
	N	46	46
Compliance	Pearson Correlation	.019	1.000
	Sig. (2-tailed)	.900	.
	N	46	46

Correlations

Correlations

		Illness Coherence	Compliance
Illness Coherence	Pearson Correlation	1.000	.354*
	Sig. (2-tailed)	.	.016
	N	46	46
Compliance	Pearson Correlation	.354*	1.000
	Sig. (2-tailed)	.016	.
	N	46	46

*. Correlation is significant at the 0.05 level (2-tailed).

Statistical Analysis for Hypothesis 2d

Illness Consequence with Compliance

Correlations

Correlations

		Illness Consequence	Compliance
Illness Consequence	Pearson Correlation	1.000	.244
	Sig. (2-tailed)	.	.102
	N	46	46
Compliance	Pearson Correlation	.244	1.000
	Sig. (2-tailed)	.102	.
	N	46	46

Appendix 11

Statistical Analysis for Hypothesis 3a and 3b

Statistical Analysis for Hypothesis 3a

Depression level and Compliance

Univariate Analysis of Variance

Between-Subjects Factors

		N
Depression Level	1.00	12
	2.00	11
	3.00	23

Tests of Between-Subjects Effects

Dependent Variable: COMPLIAN

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	220.471[a]	2	110.236	.786	.462
Intercept	213754.592	1	213754.592	1524.673	.000
Depression Level	220.471	2	110.236	.786	.462
Error	6028.473	43	140.197		
Total	241183.700	46			
Corrected Total	6248.944	45			

a. R Squared = .035 (Adjusted R Squared = -.010)

Statistical Analysis for Hypothesis 3b

Anxiety Level and Compliance

Univariate Analysis of Variance

Between-Subjects Factors

		N
Anxiety Level	1.00	5
	2.00	10
	3.00	31

Tests of Between-Subjects Effects

Dependent Variable: COMPLIAN

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	26.111[a]	2	13.055	.090	.914
Intercept	136628.552	1	136628.552	944.108	.000
Anxiety Level	26.111	2	13.055	.090	.914
Error	6222.834	43	144.717		
Total	241183.700	46			
Corrected Total	6248.944	45			

a. R Squared = .004 (Adjusted R Squared = -.042)

Appendix 12

Statistical Analysis for Hypothesis 4

Statistical Analyses for Hypothesis 4

Wtar predicted VIQ and PIQ, and Compliance

Correlations

Correlations

		Predicted VIQ	Compliance
Predicted VIQ	Pearson Correlation	1.000	.236
	Sig. (2-tailed)	.	.115
	N	46	46
Compliance	Pearson Correlation	.236	1.000
	Sig. (2-tailed)	.115	.
	N	46	46

Correlations

Correlations

		Predicted PIQ	Compliance
Predicted PIQ	Pearson Correlation	1.000	.243
	Sig. (2-tailed)	.	.104
	N	46	46
Compliance	Pearson Correlation	.243	1.000
	Sig. (2-tailed)	.104	.
	N	46	46

Appendix 13

Multiple Regression (1)

Multiple Regression - Stepwise

Predictor variables, chance health locus of control, illness coherence, illness consequence, VIQ and PIQ

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Chance Health Locus of Control	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Illness Coherence	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Compliance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.587[a]	.345	.330	9.6482
2	.694[b]	.482	.458	8.6751

a. Predictors: (Constant),Chance Health Locus of Control

b. Predictors: (Constant), Chance Health Locus of Control, Illness Coherence

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2153.093	1	2153.093	23.130	.000[a]
	Residual	4095.852	44	93.088		
	Total	6248.944	45			
2	Regression	3012.912	2	1506.456	20.018	.000[b]
	Residual	3236.032	43	75.257		
	Total	6248.944	45			

a. Predictors: (Constant), Chance Health Locus of Control

b. Predictors: (Constant), Chance Health Locus of Control, Illness Coherence

c. Dependent Variable: Compliance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	88.187	3.757		23.474	.000
	Chance Health Locus of Control	-1.042	.217	-.587	-4.809	.000
2	(Constant)	55.534	10.234		5.427	.000
	Chance Health Locus of Control	-1.061	.195	-.597	-5.442	.000
	Illness Coherence	8.158	2.414	.371	3.380	.002

a. Dependent Variable: Compliance

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Illness Coherence	.371[a]	3.380	.002	.458	.999
	Illness Consequence	.167[a]	1.366	.179	.204	.981
	VIQ	.189[a]	1.570	.124	.233	.993
	PIQ	.194[a]	1.612	.114	.239	.993
2	Illness Consequence	.146[b]	1.325	.192	.200	.978
	VIQ	.115[b]	1.017	.315	.155	.948
	PIQ	.120[b]	1.062	.294	.162	.947

a. Predictors in the Model: (Constant), Chance Health Locus of Control

b. Predictors in the Model: (Constant), Chance Health Locus of Control, Illness Coherence

c. Dependent Variable: Compliance

Appendix 14

Statistical Analysis investigating Education Length

Statistical Analysis to Investigate the Relationship between Educational Length and Compliance

Nonparametric Correlations

Correlations

			Educational Length	Compliance
Spearman's rho	Educational Length	Correlation Coefficient	1.000	.427**
		Sig. (2-tailed)	.	.003
		N	46	46
	Compliance	Correlation Coefficient	.427**	1.000
		Sig. (2-tailed)	.003	.
		N	46	46

**. Correlation is significant at the .01 level (2-tailed).

Appendix 15

Statistical Analysis investigating Education Level

Univariate Analysis of Variance for Education Level and Compliance

Between-Subjects Factors

		N
Education Level	1	35
	2	5
	3	6

Tests of Between-Subjects Effects

Dependent Variable: COMPLIAN

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	853.433[a]	2	426.717	3.401	.043
Intercept	130876.101	1	130876.101	1043.029	.000
Education Level	853.433	2	426.717	3.401	.043
Error	5395.511	43	125.477		
Total	241183.700	46			
Corrected Total	6248.944	45			

a. R Squared = .137 (Adjusted R Squared = .096)

Appendix 16

Partial Correlation

Partial Correlation with VIQ and PIQ and Compliance, controlling for Education Length

Partial Correlation for VIQ

```
 -  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S

Controlling for..    Education Length

                    VIQ          Compliance

VIQ                 1.0000        .0200
                    (    0)      (   43)
                    P= .         P= .896

Compliance           .0200       1.0000
                    (   43)      (    0)
                    P= .896      P= .

(Coefficient / (D.F.) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed
```

Partial Correlation for PIQ

```
-  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S  -

Controlling for..    Education Length

                    PIQ          Compliance

PIQ                 1.0000        .0181
                    (    0)      (   43)
                    P= .         P= .906

Compliance           .0181       1.0000
                    (   43)      (    0)
                    P= .906      P= .

(Coefficient / (D.F.) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed
```

Partial Correlation with VIQ and PIQ and Compliance, Controlling for Education Level

Partial Correlation for VIQ

```
- P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S -

Controlling for..    Education Level

                    VIQ          Compliance

VIQ                 1.0000        .0974
                    (    0)      (   43)
                    P= .         P= .525

Compliance           .0974       1.0000
                    (   43)      (    0)
                    P= .525      P= .

(Coefficient / (D.F.) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed
```

Partial Correlation for PIQ

```
- P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S -

Controlling for..    Education Level

                     PIQ         Compliance

PIQ                 1.0000        .1004
                     (    0)     (   43)
                      P= .       P= .512

Compliance           .1004       1.0000
                    (   43)      (    0)
                    P= .512      P= .

(Coefficient / (D.F.) / 2-tailed Significance)

" . " is printed if a coefficient cannot be computed
```

Appendix 17

Multiple Regression (2)

Multiple Regression - Stepwise

Predictor variables - Chance Health Locus of Control, Illness Coherence, Education Length, and Education Level

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Chance Health Locus of Control	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Illness Coherence	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Compliance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.587[a]	.345	.330	9.6482
2	.694[b]	.482	.458	8.6751

a. Predictors: (Constant), Chance Health Locus of Control

b. Predictors: (Constant), Chance Health Locus of Control, Illness Coherence

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2153.093	1	2153.093	23.130	.000[a]
	Residual	4095.852	44	93.088		
	Total	6248.944	45			
2	Regression	3012.912	2	1506.456	20.018	.000[b]
	Residual	3236.032	43	75.257		
	Total	6248.944	45			

a. Predictors: (Constant), Chance Health Locus of Control

b. Predictors: (Constant), Chance Health Locus of Control, Illness Coherence

c. Dependent Variable: Compliance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	88.187	3.757		23.474	.000
	Chance Health Locus of Control	-1.042	.217	-.587	-4.809	.000
2	(Constant)	55.534	10.234		5.427	.000
	Chance Health Locus of Control	-1.061	.195	-.597	-5.442	.000
	Illness Coherence	8.158	2.414	.371	3.380	.002

a. Dependent Variable: Compliance

Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	Illness Coherence	.371[a]	3.380	.002	.458	.999
	Education Length	.296[a]	2.533	.015	.360	.970
	Education Level	.251[a]	2.121	.040	.308	.984
2	Education Length	.218[b]	1.962	.056	.290	.913
	Education Level	.176[b]	1.581	.121	.237	.935

a. Predictors in the Model: (Constant), Chance Health Locus of Control

b. Predictors in the Model: (Constant), Chance Health Locus of Control, Illness Coherence

c. Dependent Variable: Compliance

Appendix 18

Statistical Analysis investigating Demographic Variables

Statistical Analysis Investigating the Relationship between Age and Compliance

Correlations

Correlations

		Age	Compliance
Age	Pearson Correlation	1.000	-.226
	Sig. (2-tailed)	.	.132
	N	46	46
Compliance	Pearson Correlation	-.226	1.000
	Sig. (2-tailed)	.132	.
	N	46	46

Statistical Analyses Investigating the Relationship between Gender and Compliance

T-Test

Group Statistics

	1=male, 2=female	N	Mean	Std. Deviation	Std. Error Mean
Compliance	1	34	71.8824	10.8508	1.8609
	2	12	70.2833	14.5878	4.2111

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Compliance	Equal variances assumed	1.883	.177	.400	44	.691	1.5990	3.9943	-6.4509	9.6489
	Equal variances not assumed			.347	15.518	.733	1.5990	4.6040	-8.1856	11.3837

Statistical Analysis Investigating the Relationship between Marital Status and Compliance

T-Test

Group Statistics

	1 = married, 2 = not married	N	Mean	Std. Deviation	Std. Error Mean
Compliance	1	35	72.2029	11.4764	1.9399
	2	11	69.1182	13.0048	3.9211

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Compliance	Equal variances assumed	.115	.736	.754	44	.455	3.0847	4.0930	-5.1642	11.3335
	Equal variances not assumed			.705	15.2	.491	3.0847	4.3747	-6.2277	12.3971

Statistical Analysis Investigating the Relationship between Occupational Status and Compliance

T-Test

Group Statistics

	1 = manual, 2 = non-manual	N	Mean	Std. Deviation	Std. Error Mean
Compliance	1	28	69.3571	12.6736	2.3951
	2	17	74.9353	9.9469	2.4125

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Compliance	Equal variances assumed	2.550	.118	-1.546	43	.129	-5.5782	3.6076	-12.8536	1.6973
	Equal variances not assumed			-1.641	40.036	.109	-5.5782	3.3995	-12.4486	1.2923

Univariate Analysis of Variance for Subjective Health Status and Compliance

Between-Subjects Factors

		N
Health status: 2 = poor 3 = good 4 = very good	2	3
	3	27
	4	16

Tests of Between-Subjects Effects

Dependent Variable: COMPLIAN

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	151.848[a]	2	75.924	.535	.589
Intercept	104249.557	1	104249.557	735.224	.000
Health status	151.848	2	75.924	.535	.589
Error	6097.096	43	141.793		
Total	241183.700	46			
Corrected Total	6248.944	45			

a. R Squared = .024 (Adjusted R Squared = -.021)